

MICK

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£100

PERSONAL

Computer

NEWS



**New from
Commodore**

COMMODORE AND ATARI STEAL THE SHOW

**Magnificent seven
from US giants**



**New from
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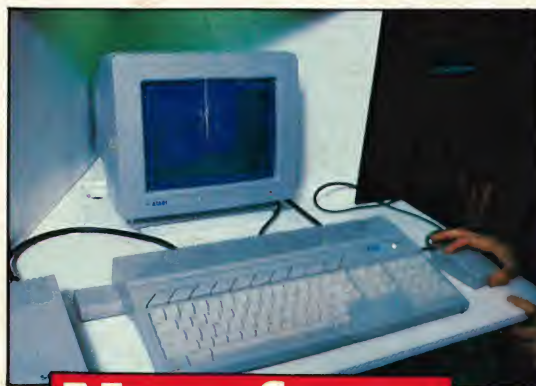
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More ways
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PLUS...

Programs for QL,
64 and BBC



**New from
Atari**

**NEWS
EXTRA
INSIDE**

Choosing a printer is a lot easier than choosing a computer.

THERE are dozens of quality printers from which to choose. With quality price tags of around £250.

The Brother M-1009, however, breaks all the rules.

Stays defiantly below the £200 barrier.

Though it has far more than its fair share of features, it maintains the extraordinarily low price of £199.95.

Travels at a steady fifty.

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Providing bi-directional and logic seeking printing for normal characters and uni-directional printing for super and sub script and graphics.

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Being an impact printer, the M-1009 will print on virtually any paper, including letter headings, invoices and standard office stationery.

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MENU

Apologies to faithful followers of the Next Week panel on the Quit page. In recent weeks we have constantly been overtaken by events — this issue is no exception.

Those of you eagerly looking forward to our reviews of home robot systems will have to contain yourselves. We decided to hold that for a while in view of the momentous events in Las Vegas. Watch out for robots (and other missing features) in coming issues.



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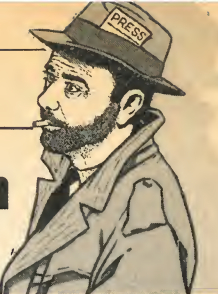
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CES SHOW

Magnificent seven lead out by Atari



When the wreckage was cleared away and the bodies removed, the score at last week's Consumer Electronics Show in Las Vegas was Atari 5, Commodore 2.

'Business is War,' says Atari boss Jack Tramiel, and his new-look corporation went for every jugular in sight, as its multiple product launch stopped the show. Commodore hit back, but was beaten for panache, scope, and sheer nerve. The rest were nowhere.

The Atari slogan at Las Vegas was 'Power without the Price'. When the dust settles and the machines get the chance to prove themselves, we'll know about the power; but the prices are amazing. On paper Atari has killed off the Macintosh, the QL, and any number of mid-range micros in one fell swoop.

That's on paper. Coleco made a splash along the same lines at the same show two years ago, and in the end it couldn't deliver. Atari's machines look far more ambitious, but with Tramiel involved anything could happen.

As he'd promised before Christmas, Atari had complete families on show at Las Vegas. The XE line of 8-bit systems are direct descendants of the 800XL; the ST twins break new ground for Atari with Motorola 68000 processors. For good measure there were also new peripherals and some startling software. Members of the Tramiel family were also in evidence.

From the bottom: the 65XE is an 800XL with a face-lift, but the differences aren't all superficial. The XE range has re-jigged circuitry, with the result that they are visibly faster than the 800XL and reputedly more reliable. The 65XE will cost about \$120.

The 65XEM adds a music synthesiser to the basic design — its price will be under \$160. The 65XEP is a luggable version of the 65XE, with a built-in 3.5in floppy drive and a 5in monochrome monitor, for about \$400.

At the top of the XE range is the 130XE, with 128K to the 64K of the others. This machine will reach US shops later this year with a price tag of about \$200. Like the others, it's driven by a 6502 with a new version of Atari DOS. Owners of the 800XL are promised an upgrade from their DOS 3.0 to the new version, and Atari is claiming compatibility with all 800XL software for the new systems.

The XE range looked good in its own right, but it turned out to be just an appetiser before the main course — the 130ST and the 520ST. Both machines run a 68000 processor with a proprietary operating system that is still called TOS (Tramiel Operating System). Anybody who thought that this might be a temporary name while something more suitable was devised looks like being disappointed. Tramiel seems to be making a bid for immortality in more ways than one.



Atari 130ST — what price a tatty old Mac with this on the way?

TOS incorporates Digital Research's GEM. That means mice, windows, icons, hand-some graphics, the whole Macintosh kit and caboodle. Wags around Las Vegas were calling the machines Jackintoshes. With 128K and 512K they will cost \$399 and \$699 respectively.

Apple executives will find it hard to hide the lump in their throats. IBM will refuse to

Tramiel also launched a disk drive. Like everything else, its price is breathtaking — 500K on a 3.5in drive for \$100. It can be hooked up to any of the new systems, EX and ST alike. A 3.5in hard disk is due to follow shortly, offering 10Mb. Shell-shocked industry analysts wouldn't speculate on what the price tag on 10Mb might be.

Atari demonstrated a trio of printers in the \$50 to \$100



Centre of attention — Atari rules the roost at the CES.

comment, since it never acknowledges competition; if it gets its head out of the sand it may find that Atari has stolen its feathers.

The crucial feature will be software. Atari demonstrated an impressive package called Infinity on the XE range, but applications for the STs will depend on how well software suppliers respond to TOS. Infinity is a combination of spreadsheet, word processor and re-

range. There was a thermal colour printer, an impact dot-matrix unit, and a daisywheel. The company said that these devices were compatible with current Apple and IBM machines, and you got the impression that Atari was on the offensive even here.

The other 1,399 or so exhibitors could only look on in awe. Atari's new systems should start appearing in the US in the spring. But Commodore clawed



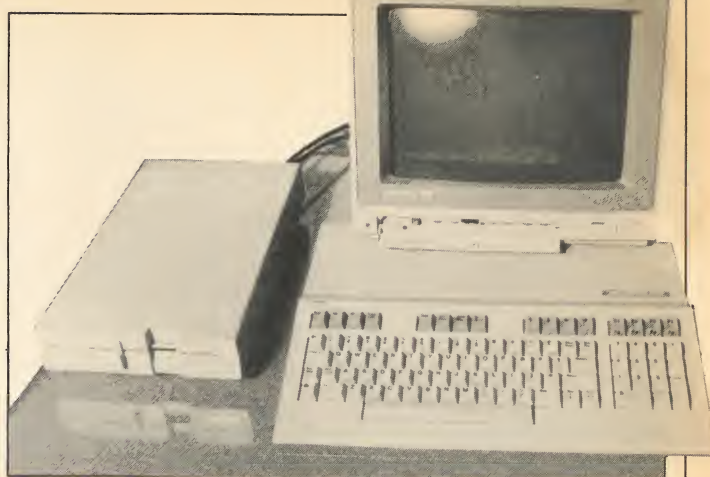
XEP — new-look Atari packaging around 800XL compatibility.

lational database with on-line help, windows, and a shared command structure, described by an observer as 'jazzy'.

GEM (and CP/M-68K) are implemented in ROM on the STs, but for old time's sake

back some of the attention with a couple of releases of its own. At any normal show it might have made the headlines.

The C128 (whose appearance was forecast in last week's PCN) proved to look completely



Commodore's 128 plus business additions — a Plus/4 killer?

unlike any previous Commodore system, and the company has broken with another tradition by making it compatible with the 64. But, elegant as it was, it paled beside the clumsily named Commodore LCD.

This is a portable in the tradition of the Tandy Model 100: it tips the scales at 3lbs, carries 32K of RAM, and has basic business software built-in. The LCD name refers, of course, to its screen, an 80 by 32 display. Power is from standard batteries or, through an adaptor cord, from the mains. It is expected to cost about \$500.

The C128 appeared with a trim half-height 360K disk drive, and the layout on Commodore's vast display area was calculated to appeal to business users as well as home micro fans. The system has the dimensions of an Apple IIc, and a keyboard with clusters of keys all over the place.

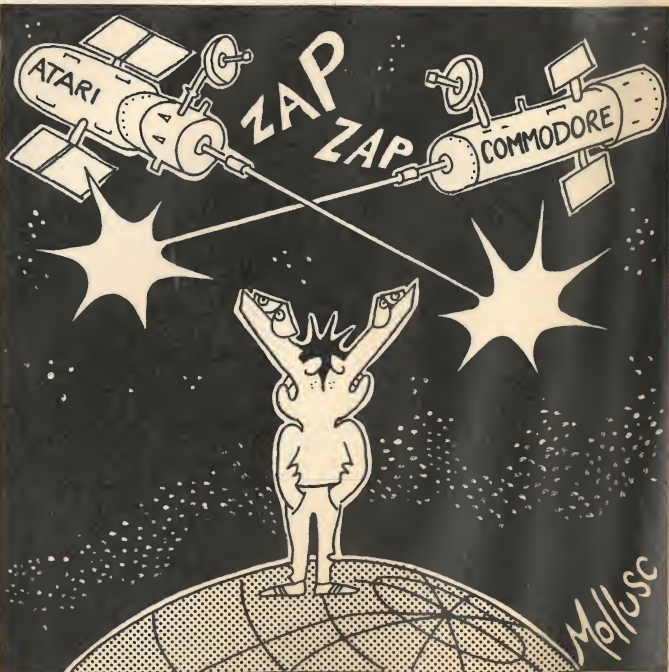
Will the C128 put pressure on the Plus/4? Its price is likely to be about \$250; its 128K can be built up to 512K and it holds out the rather vague promise of

'CP/M-compatibility'. In any other context this would look very attractive; but at CES, with Atari running amok, the Plus/4 looks irrelevant.

Commodore might have stolen some of Atari's thunder if it could have demonstrated the Amiga machine — or it might have risked having the system submerged before it has a chance to make an impact.

In the world's most famous gambling city Jack Tramiel was in his element. The most awe-inspiring feature of Atari's performance at CES is that the new machines are the first to be released under his leadership — it was far from being the last desperate throw of a cornered man. There are more on the way: 32-bit systems due to be demonstrated in the spring.

According to Tramiel, he spent a lot of last year touring Atari's manufacturing plants and building up capacity. If the market responds to his new machines in the way you'd expect, the company will need every last inch of production line to meet demand.



Money talks in Currah collapse

Currah Computer Components, well-known for its speech synthesis devices, has been bought out by DK Tronics.

The Hartlepool-based company went into receivership on December 20, and following a request by the directors of Barclays, MJ Moore and DM Middleton of Coopers and Lybrand were appointed as joint receivers to attempt to find ways of resolving the company's problems.

Then in stepped DK Tronics, with expertise in the same field as Currah, with a bid to rescue it from sinking. Neil Rawlinson, financial director of DK Tronics said: 'The reason why DK Tronics has bought Currah is to ensure the Currah name and reputation is maintained.'

'Currah's products are complementary to our own. We have both produced speech devices for popular home micros.'

'In addition to giving support and backup to the current Currah range of products, we are going to finish off the final development of a product called Microsource which Currah was working on.'

If you intend buying a Currah speech add-on you should keep a sharp eye on the warranty. Although DK Tronics has exclusive rights to manufacture, market, and sell Currah products, Welwyn Electronics also has some contractual rights to sell to retail outlets stocks of Currah products it has.

In a statement from the receivers the situation was clarified: 'At the date of receivership, Welwyn was the sole manufacturer for Currah's Microspeech, Microslot, and Speech 64.'

'Welwyn has stock of the above products which it has decided, as it is entitled to, to sell to the market direct. The right stems from a contractual situation between Welwyn and Currah, and ends when Welwyn has disposed of outstanding stock.'

'The receivers feel that it's important to stress that Welwyn has purchased none of the support information and backup to the products that now belongs to DK Tronics.'

What this boils down to is that Welwyn will have to put its own warranty card with products sold — and therefore has the responsibility to support and backup any of its products.

Spectrum/C64 top Xmas micro sales

Sinclair with the Spectrum and Commodore with the 64 were the winners in the last-minute Christmas sales rush.

Between them they accounted for around 65 per cent of all home micros sold with the Spectrum (in both its guises) outselling the 64.

For Acorn, the figures make depressing reading. Despite its expensive TV advertising campaign, the Electron accounted for only around nine per cent of home micro sales, and the BBC B around four per cent. In fact, the BBC B was overtaken by the Amstrad, which accounted for around five per cent of all sales. The Commodore 16 accounted for four per cent.

Perhaps the biggest loser was MSX, which taking all models together barely made an impression on the buying public. This was predictable, as few of the MSX manufacturers showed any sign of wanting to take this Christmas seriously.

The figures come from RAM/C, the market research company that compiles the PCN Charts (see page 5). According to Simon Treasure, RAM's managing director, Sinclair's and Commodore's share of the market is a significant increase on last year, and they now dominate this market sector.

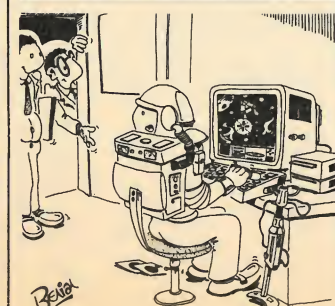
News of the figures hit Acorn's share price with the

company forced to respond with a public relations campaign to re-inspire City confidence. An Acorn spokesman said that sales of both the BBC and the Electron over the Christmas period were satisfactory.

Win £100 per words!

This could be the easiest £100 you've ever made — thanks to PCN's unparalleled generosity. In last week's *Random Access* page we omitted the caption on Benian's cartoon (reprinted below). All you have to do to get your hands on the cash is write your own caption — tell us what any of the characters might be saying.

The entry deemed the funniest by the laugh-a-minute staff of PCN will receive the £100. Send your entry to Missing Caption Competition, *Personal Computer News*, 62 Oxford Street, London W1A 2HG, by Friday, January 25.



Sending the MSX menace packing

Japan over Christmas and the New Year should be a home computer owner's dream: most companies shut down from noon on December 28, not to open again until January 4. This year my company extended that to January 7, thereby providing an abundance of time for personal computing. So why is it that I feel I'd rather have gone to the office?

The reason is MSX, which has invaded my home. Yes, we're a two-computer family, and if my experience is anything to go by there should be an adventure game on the pitfalls of introducing a games-type computer into the home.

In Japan at the moment there are two classes of citizen: the proud, patriotic, upstanding type who buys an MSX micro and glories in it; and the neo-Luddite who skulks in dark corners avoiding the ladies who press white feathers into his clammy palms. Under these circumstances I hardly had a choice.

You may have read that MSX isn't going down too well in its native land, but like everything else you read in the papers (well, almost everything — we still strive for excellence in some quarters), you ought to take this with a pinch of salt. From all appearances MSX is gathering strength all the time, and there is excited talk of MSX II, which is supposed to be just around the corner.

Meanwhile, as I reported in a previous column, the prices are attractive and they're becoming more so all the time. There is an element of the football pools about all this, or, to borrow a slogan from the national Australian lottery, 'You've got to be in it to win it'.

There is a standing rule here that my kids can watch television for 30 minutes of their choice every day. If my wife wants to watch something, they're welcome to join her. In some mysterious fashion, they have worked out a schedule of programs they've all agreed to watch, but when my daughter missed her favourite show because her older brother has the MSX machine linked to the set, the *entente cordiale* became the *enfant terrible*. I don't know

where she learned the language she used, but MSX gained another enemy in the house.

Then my wife got involved with a game called *Clapton II* (nothing to do with the cream of blues guitarists or the much maligned town near London). It's my solemn belief that nothing should come between a man and a hot cup of tea — now it seems that my demure Japanese wife would rather blast objects in space than put the kettle on to boil.

And naturally, as I'd expected, my seven-year-old son takes great delight in embarrassing me at a game called *Pair-Pair*, in which the object is to match hidden pairs of fruit, vegetables and animals while avoiding being gobbled up by little black things that wander about the screen. Not only has he managed to embarrass me in front of his friends, but on one occasion in front of mine.

In desperation I turned to my own machine for the companionship and solace that old friends are said to offer. Ha! A simple act like updating my mailing list on *dBase II* turned into an act of contrition, with a dozen or so letters aimed at various destinations around the globe. Looking on the bright side, I'd again managed to avoid writing the accounts receivable and invoicing program I'd been meaning to set up to keep track of my free-lance work.

Not that I get to do too much of that. I'm the only writer at the office with a word processor at home, so guess who got to bring home an urgent project. Working at the office with only the telephone for interruptions is one thing, but working at home with three children, a wife, and an MSX computer with ear-shattering sound effects, each trying to outdo the other, is a situation no writer should have to endure.

So I didn't. For all their faults, MSX systems are lightweight and compact. They pack easily into the trunk of a car, and hook up just as easily to grandparent's television as they do chez Powell.

So it was with great pleasure that I stood in the driveway waving goodbye to my wife and kids as they headed off in the direction of the grandparents. I must confess I even uttered a slightly vindictive chortle as I remembered that the most audible irritant among the accompanying ROM packs had been a Christmas present from their grandfather.

Until I remembered that although it does many things well, I've yet to figure out how to teach my trusty NEC to make a proper cup of tea. Naturally I blame that on MSX as well — wouldn't you?

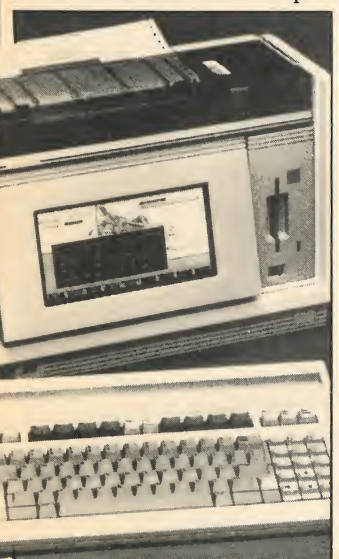
Serge Powell

Unix on the move with H-P source

Personal computing took another step forward last week with Hewlett-Packard's launch of the Integral, a luggable micro that runs Unix.

Unix or one of its clones is usually regarded as the operating system of the future, a multi-tasking environment that will take over from MSDOS as the standard in microcomputing. So far it has been living up to its billing in dribs and drabs, but the appearance of the Integral could give it a shot in the arm.

Hewlett-Packard's machine weighs in at 25lbs. Besides Unix System III implemented under the name of HP UX, it offers 512K of RAM, 32K more to drive the 9in amber electro-luminescent screen, 256K of ROM to accommodate the oper-



H-P Integral: Unix on the move.

ating system, a built-in 710K floppy, and the H-P Thinkjet printer — an impressive package for the price of £5,450.

H-P says it expects the machine to sell mainly to scientific and engineering users (the company's traditional market), but it has also put windows and its Personal Applications Manager into the bundle.

Version 7 Unix, at the core of System III, was developed in 1977, but wasn't distributed until 1979. Estimates of the number of working Unix or Unix-like systems in the UK last year vary from 4,500 to 12,000 — a minute total when you consider that there are now more than 200 hardware vendors offering Unix or its more common derivative, Xenix (75-80 per cent of Unix licences around the world are, in fact, for Xenix, Microsoft's version that recently won the support of IBM in its PC AT).

Business software publishers are making sure that when

Unix takes off they'll be in a position to supply the applications. Redwood, for example, claims to have the first integrated packages developed in Europe for Unix systems.

But the turning point will probably come when users move in large numbers from stand-alone single user personal computers to communicating, multi-tasking systems.

R&R and Abbex — '85's first casualties

Two software companies, R&R Software and Abbex, saw in the New Year by going bust.

Robert Brencley, managing director of R&R, blamed large sums of money owed to it by a South African company, allied to a bleak Christmas period, for the downfall of the business.

He said: 'It was a quiet summer, but we were keeping our head above water. Then came Christmas and we thought we'd have good sales — but it didn't happen.'

R&R's best-known game for the Spectrum was appropriately called Titanic, and the company was in the process of making a 64 version. However, on December 12 things ground to a halt, and the receiver Mr David Lovett was brought in on January 8, 1985.

Mr Brencley, who will find refuge in the industry doing freelance work, had no immediate plans to start all over again. 'It would be unwise to jump into a similar venture as a lot of medium-sized companies are having a hard time at the moment,' he said.

Abbex also hit the dust. The last game that the company produced was All or Nothing for the Spectrum. Numerous attempts to contact the company last week failed.

Further signs of trouble and strife in the computer games market come from K-tel. It has withdrawn financial backing from its software subsidiary Front Runner 'for the time being'.

A spokesman for K-tel said that Front Runner is continuing to trade and will continue to fill orders for existing products; but it is not planning to bring out any new titles.

Wayward path for Spectrum upgrade

Sinclair has come up with an upgrade path for Spectrum owners, to the surprise of some of its staff. But the cost of the upgrade is the difference between a new Spectrum and a new Spectrum Plus, unless you fancy yourself with a soldering iron.

The kit costs £30 and the upgrade service £50. It may pay you in the long run to make the change one way or the other — Sinclair says that future software and add-ons will be designed with the Plus in mind.

Sinclair is advertising the upgrade widely. 'That must be why we're getting people's machines in,' said a Sinclair livewire as realisation dawned. See Quit (page 48) for a full explanation of the upgrade.

Optical reader for mass market

Optical character recognition is at last available for the mass market with the launch of the Omni-reader from Oberon International. (Tel. 0442-3803).

The Omni-reader is a device that lets you read the printed word directly into a computer via the RS232 port. Previous machines that could do this cost from £6,000 to £10,000. The Omni-reader is a breakthrough at a price of £458.85, although it is limited.

The four typefaces it is capable of reading are courier 10, courier 12, letter gothic 12, and prestige elite 12. It may also be possible, at a later date, to load new fonts from the host computer.

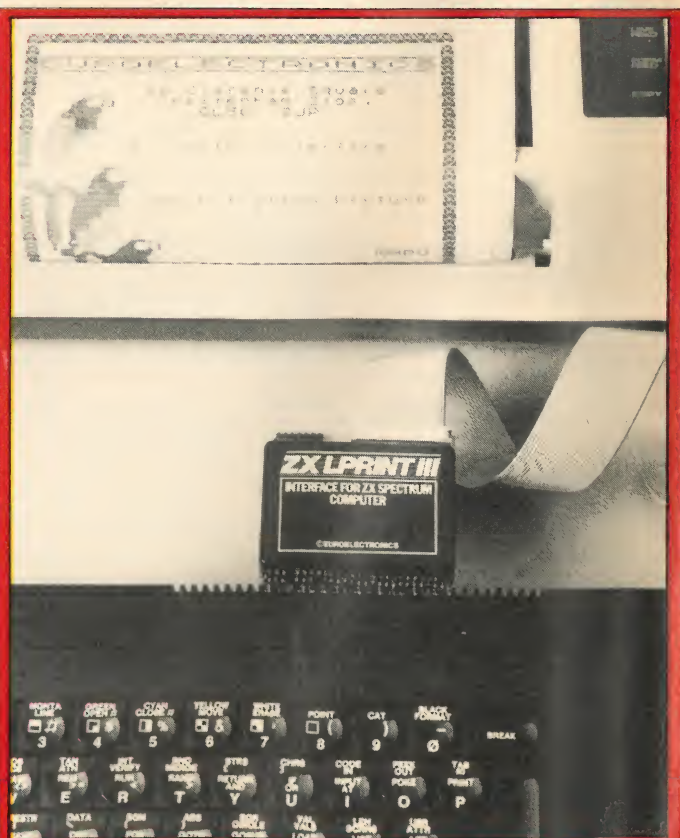
Omni-reader is a manual



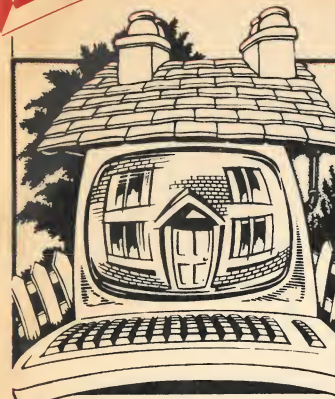
Read Only Memory — Omni-reader takes it all in.

system that uses a scan head moved across a line of text by hand, using a ruler as a guide. The data is output via an RS232 port as ASCII characters, and the accuracy depends on the quality of the text to be read. Oberon claims that on average there will be only one error per A4 sheet.

At the moment there is software for the IBM PC only, but Oberon will be bringing out software for CP/M systems, the Apple IIe and IIc, the Mac, the Lisa, and the Sirius. The complete package also includes full details on the RS232 connection.



FULL SPECTRUM — Unfortunately, this black-and-white photo does not do complete justice to the new version of the ZXPrint III printer interface for the Spectrum. Euroelectronics (0684-292448) has upgraded the firmware so that it can now handle screen dumps in glorious technicolour, on printers like the Epson IX80, Seikosha GP700, and MCP40. The interface costs £34.95 and the printer cable (RS232 or Centronics) £9.95.



Dominant duo should look to their laurels

Behind the news that Sinclair and Commodore dominated the Christmas sales table (page 3), there are signs that a more significant change is taking place in the home computer market.

For a start, home computer sales this Christmas were no higher than in the previous year. This has led some prophets of doom to forecast that the great home computer boom is over. But as always, the entrails of Christmas require careful reading.

In terms of actual machines, sales may have levelled out. But sales of software, peripherals and upgrades have surprised some retailers.

'Overall, we probably sold about the same value as in previous years, but fewer computers,' said John Flatman, merchandise controller for Boots. 'The peripherals and software business was very buoyant and disk drives sold particularly well,' he added.

'Sales were really very good, well up on last year,' said Richard Francis, retail operations controller for Dixons.

'The principal reason for this was our special promotions like the Commodore business outfit, which bundled the 64 with disk drive and printer,' he added.

On the software front games continued to dominate the sales chart but as with the hardware, the winners were the big names with top selling titles.

Simon Treasure, managing director of market research company RAM/C, agrees that software sold very well over Christmas. 'The big dozen software houses did particularly well but after that sales started to fall away very rapidly.'

In the peripherals sector, equipment related to games playing, such as joysticks, did best of all.

So why the trend away from hardware to software and peripherals? First, most people who are likely to buy a home micro have already bought one or had one bought for them.

Second, having acquired a

micro, most users now want to put it to work, usually as a games machine. Hence the sales of games software and peripherals like joysticks.

Christmas also confirmed that the shakeout of the computer industry is well under way. Sinclair and Commodore increased their stranglehold of the market because quality software for these machines is so abundant.

This creates a vicious circle. The reason for the abundance of software is the large user base for the Spectrum and the 64.

The good news is that these machines should continue to be good sellers for some time.

The bad news is that users could find themselves locked into a dependence on these machines, both of which are beginning to look dated.

Commodore admittedly appears to be making the right move with the US launch of the C128 — a machine that offers a higher performance while maintaining compatibility with the 64.

An alternative strategy is to diversify into other areas such as the business market. But Sinclair's and Commodore's attempts to tap the low priced end of this market have not been markedly successful.

Both the QL and the Plus/4 have flopped as volume sellers, probably because neither has appealed to the top end of the home market (no games software). Nor have they appealed to the serious business user who is probably looking for something that has proper disk drives and is compatible with existing office machines.

The continued growth of games software suggests that home micros are still seen by the buying public as a home entertainment product.

Which is probably where MSX could come in. Sony has already demonstrated a home micro with a video interface that can be used to generate titles on home videos. Yamaha's MSX machine can be used to drive its electric organs.

In the not too distant future we are likely to see home micros that can interface with video disk players, opening up the possibility of interactive video games.

Which ever way you look at it, no home computer manufacturer — least of all British manufacturers — can afford to rest on its laurels.

In the games machine market, Sinclair and Commodore have effectively seen off the opposition. Anyone wanting to stay in the volume computer business would do best to concentrate on the next generation of machines that the buying public will want. **Ralph Bancroft**

GAMES

TW	LW	TITLE	PUBLISHER	MACHINE	PRICE
1	1	Ghost Busters	Activision	SP,C64	£9.95
2	2	Airwolf	Elite	SP	£7.95
3	3	Match Day	Ocean	SP	£6.90
4	5	3D Star Strike	Real Time	SP	£5.95
5	11	DT's Decathlon	Ocean	SP,C64	£7.90
6	6	Elite	Acornsoft	AC	£15.00
7	4	Knight Lore	Ultimate	SP	£9.95
8	13	Skool Daze	MicroSphere	SP	£6.95
9	9	HunchBack II	Ocean	SP,C64	£7.90
10	8	Select 1	Comp Records	SP,C64	£12.49
11	10	Doomdark's Rev.	Beyond	SP	£9.95
12	7	Staff of Karnath	Ultimate	C64	£9.95
13	14	Gift of the Gods	Ocean	SP	£9.95
14	20	Kong Strikes Back	Ocean	SP,C64	£7.90
15	12	Underworld	Ultimate	SP	£9.95
16	19	Combat Lynx	Martech	SP,C64	£7.95
17	15	Raid over Moscow	US Gold	C64	£9.95
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19	—	F15 Strike Eagle	US Gold	C64	£9.95
20	—	Sabre Wulf	Ultimate	SP,AC	£9.95

SPECTRUM			COMMODORE		
TW	TITLE	PRICE	TW	TITLE	PRICE
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3	Match Day	£6.90	3	HunchBack II	£7.90
4	3D Star Strike	£5.95	4	Kong Strikes Back	£7.90
5	Knight Lore	£9.95	5	DT's Decathlon	£7.90
6	DT's Decathlon	£7.90	6	Raid over Moscow	£9.95
7	Skool Daze	£6.95	7	Select 1	£12.49
8	Select 1	£12.49	8	Booty	£2.50
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8	MSX (series)	£250	8	Apple III	£2,755
9	Einstein	£500	9	ACT Sirius	£2,525
10	Sharp MZ700	£250	10	Macintosh	£1,795

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets during the week up to January 10. The games chart is updated every week. The prices quoted are for the no-frills model and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and is updated every month. PCN Charts are compiled exclusively for us by RAM/C, who can be contacted on 01-892 6596.

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RANDOM ACCESS



Your opportunity to vent spleen or bestow praise on PCN. Let us know your reactions to what appears between these esteemed pages: what you've liked — and what you haven't. Write to Random Access, Personal Computer News, Evelyn House, 62 Oxford Street, London W1A 2HG. The grand sum of £15 goes to the star letter.

Anti-MSX stand leads to dead end

I looked at myself in the mirror this morning and as far as I can see my skin isn't yellow and my eyes don't slant. That's reassuring when you're psyching yourself up to write a pro-MSX letter to PCN.

To judge from recent letters, you're preaching to the converted with your anti-MSX stance. Sir Clive of the Black Watch has an obvious axe to grind, I suppose, but Anthony Cleall on last week's page misses the point by such a long way that he ends up almost arguing against himself.

You don't have to be a Spectrum owner to know that it's out of the question to buy a new computer every time a better one is produced. It's possible that Spectrum owners actually have an advantage in this respect — the chances are that they paid so little for their machines that they can consider buying another more easily than those of us who forked out £200 or more. But that's beside the point. Producing newer and better machines isn't the way to beat the Japanese.

Acorn has the right idea with the BBC B; here's a machine that can serve as the engine-room of a system that can be expanded in any number of ways. Sir Clive can't do that with the Spectrum because the Spectrum isn't suitable for anything that needs more than two or three key strokes. But the BBC B is expensive. What we need is a half-way house — a system that can be expanded without costing you an arm and a leg in the process.

Isn't that what MSX will offer? I don't know whether they've got disk drives sorted out yet, and I don't know what the impact of MSX Mark 2 will be, but it seems to me that a group of big companies that set out to promote a standard can be relied on to maintain compatibility as the standard and the systems develop.

The prospect of a Spectrum with extra ROM and perhaps a music synthesiser is enough to make a cat laugh. It wouldn't be a Spectrum any more, so why not call it a day and put it out to grass somewhere while you go ahead with a system that will let you expand in those kinds of ways.

It needn't be MSX, strictly speaking. An Electron, an Amstrad, maybe even an Oric will give you the same scope eventually. But you're still out on a limb with them. With an MSX machine you'll have first call on all the little extras that people put out for all the systems in the group.

At the moment that could mean any one of a dozen micros. Isn't anything else a dead-end street by comparison?

Jim Tappy,
Plymouth.

'Doomdark' map dig unfair?

In your review of air game Doomdark (issue 93) you say we are cashing in with our Icemark chart; actually we are not.

To obtain a map of the Icemark, Mike had to write a special program. That took time and he couldn't do it until the game was finished. As he didn't finish the game until the day before we went to duplication we were obliged to put a pretty picture on the back of the rules — pretty, but no help to anyone; so the map seemed like a good alternative.

We produced the illustration and had the map printed and produced in one week flat (delivered on December 21), and kept the price to £1.95. If I gave it to our mail order fulfilment house, they would charge me £1 handling per item, so we would end up making nothing at all.

To hold costs further I spent

Christmas Eve, and the two days after Christmas stuffing maps into envelopes. We've sold over 1,000 to date, and people are now asking us for *Midnight* maps. So there.

We are going to be producing more add-ons like the map. I hope to get an *Midnight* map out in February.

Clive Bailey,
Beyond Software.

User group member moans

In June 1984 I paid £10 to the Independent Sinclair User Group (189 Rosehill Road, Burnley, Lancs) as my first annual membership fee. Within a few days I received the first newsletter. Since then, despite writing several letters, I have received nothing further. Neither have I had a reply to my letters.

The Independent Sinclair User Group is reputedly run by a man called Vic Webber. If Mr Webber is reading this letter I invite him to justify his lack of action while holding money belonging to other people.

If any of your readers have had the same problem, or indeed if they have had successful dealings with this group, I should be obliged if they would write to me as soon as possible, so that I can get a clearer idea of what's going on.

John Schofield,
Lancs.

Over to you, Mr Webber — Ed.

Compatibility claim misleads

McGraw Hill publishes a business program for the Spectrum called Projector 1, which is good for displaying data in the form of graphs; however, potential users should be warned that, although it is described on the cover as 'Microdrive Compatible', they should not imagine that the program can be put on Microdrive. It takes five minutes to load the program from cassette. Only the data can be stored on Microdrive.

I think this term 'Microdrive Compatible' should be used only where the program itself can be loaded from Microdrive. This is especially true of business programs. Who wants to have to load an important presentation from cassette, waiting five or more minutes?

Other important practical programs for the Spectrum — Tasword and Masterfile — can be loaded from Microdrive, and I regard these as genuinely compatible.

E G Matthews,
Dorset.

Virtues of Sanyo extolled

I certainly agree (Routine Enquiries, issue 90) that the Sanyo MBC is a worthy alternative to the QL. Indeed, I bought my Sanyo in June after cancelling a QL order, and have been pleased with the decision. But I really must take up the insinuation that the Sanyo only runs bundled software.

I have up and running Friday, dBase II, Cardbox, Easywriter, Wordstar Professional with Correctstar and Starindex, Multiplan, Supercalc 3 (with excellent graph making ability dumpable to a wide variety of printers), Pascal, Fortran 77, a painting programme called Graffiti, not to mention some arcade games that would put the 'populars' to shame.

Any Sanyo owners out there who would like to know how to get these programs can ring me (01-986 6752). PCN might like to contact us at the Sanyo User Group before publishing rash comments about the machine. Keith Teare,
50 Airmead House,
Kengsmead Way,
London E9.



Machine code!! I can't even understand the Green Cross Code.

MICROWAVES



Got any good tips for Commodore users, or sparky ideas for the Spectrum? Then air your discoveries in the forum by sending them to us. £10 for every answer printed and £50 for the Microwave of the month. Send to Microwaves, Personal Computer News, Evelyn House, 62 Oxford Street, London W1A 2HG.

Flashy interrupt for the Atari

This machine code routine uses a vertical blank interrupt to flash the cursor on any Atari. In the routine it decreases memory location 71. When this reaches zero it turns the cursor off (using POKE 755,0), then repeats this but turns the cursor back on (using POKE 755,2). As POKE 755,0 also turns off inverse characters, this routine also flashes anything printed or typed in inverse.

After running this program it

will continue until the computer is turned off or reset is pressed (typing A=USR (1536) restarts the routine).

To change the speed at which the cursor flashes, alter line 105. Replace this number by the speed you want. The higher the number is, the slower the cursor will flash. After doing this RUN it and NEW it. If you wish to change the speed type POKE 1538, speed, (speed being the number for your speed) then type A=USR (1536) >.

Jason Gosling,
Notts.

```
5 REM FLASHING CURSOR BY JASON GOSLING
10 FOR N=1536 TO 1592: READ I : POKE N,I : NEXT N
20 A=USR(1536)
30 END
100 DATA 104,169
105 DATA 16
110 DATA 133,70,165,70,133,71,160,19,162,6,169,7,32,
    92,228,96
115 DATA 198,71,240,3,76,98,228
120 DATA 169,2,205,243,2,240,12,169,2,141,243,2,165,
    70,133,71,76,98,228
130 DATA 169,0,141,243,2,165,70,133,71,76,98,228
```

Spectrum half-way measure

If you want to save a program still under development and clear the computer's memory to test a subroutine or program lines before incorporating them, you may find this procedure useful:

```
1 Let a = PEEK 23637 + 256 * PEEK
23638: PRINT PEEK a: PRINT PEEK
(a+1): STOP
```

Enter RUN 1 and note down the two Peeked numbers given. Now change the line to:

```
1 Let a = PEEK 23637 + 256 * PEEK
23638: POKE a,64: POKE (a+1),0:
STOP
```

and enter RUN 1. All the program lines after number 1 should vanish. Now any sub-routines or other lines can be entered to be tested and even RUN, to get them right.

To return to the original program, it is essential to delete any temporary lines by using the edit key in the usual way, after which, enter RUN 1 (to reset Var a), and enter as a direct command:

"POKE a, (the first number noted): POKE (a+1), (the second number)", and it will re-appear.

R Luxton,
Solihull, West Midlands.

16K random access files

BBC owners can create random access files on disk using less than the 16K of disk space claimed by the OS.

The manuals mention that since any file can be accessed by the random access commands (OPENIN, OPENUP, PRINT £, etc), you can reserve disk space for files longer than 16K simply by using *SAVE "filename" SSSS+LLLL to save any block of code of the required length from anywhere in memory (ie, any garbage at all). You can then write to and read from the file using OPENUP ("filename") and OPENIN ("filename").

You can use the same techni-

que to create files on disk shorter than the default 16K. x = OPENOUT ("NAME") : CLOSEX. This creates a file on the disk, while the operating system reserves the default 64 sectors, or 16K.

*SAVE "NAME" 0000+8000. This creates a file on the disk, 32K long, which can be accessed by OPENUP and OPENIN in the usual way.

*SAVE "NAME" 0000+00FF. This creates a file on the disk only 255 bytes long, which can also be accessed in the usual way, by OPENUP and OPENIN. This is a very handy technique for storing small data files, without using large amounts of disk space.

Archibald McDonald,
Glasgow.

```
10 REM : HIRES OVERLAY
20 POKE 48000,156 : REM PUT UP OVERLAY
30 POKE 704,3 : REM SET STATUS AS HIRES
40 CURSET 0,0,0
50 FILL 135,40,64 : REM CLEAR SCREEN OVERLAY
60 CURSET 100,60,1
70 FOR N=1 TO 50 STEP 5
80 CIRCLE N,1 : REM JUST A DEMO
90 NEXT N
100 CURSET 6,0,0
110 FILL 135,1,5 : REM INK CHANGE
120 END
```

Oric overlay delusions

You can usefully delude your Oric 1 or Atmos by exploiting the strange effect that pressing ESC and DEL together has. The program above overlays the Text screen with the Hires screen by poking 48000,156. It then overcomes the restriction of not being able to draw on this psuedo window when in Text mode by convincing the Oric that it is actually in Hires mode with a POKE 704,3.

If you have just switched on, poking location 48000 with 156 reveals the Hires screen filled with vertical lines. You can now move your cursor around the screen and it disappears under the overlay and re-emerges. Try typing some text when the

cursor is out of sight, then type Return a few times to bring back the cursor. Next, type POKE 48000,32 and you will find your text screen with all you previously typed.

The following listing is a demonstration. Remember that the Oric thinks it is in Hires, so TEXT or POKE 704,2: POKE 48000, 32 returns things to normal.

Do not try to use a y-axis value greater than 135 and remember which mode you have poked 704 with as PRINT AT etc will not work in Hires (ie, 704 contains 3). Finally when in Text, POKE 704,1 provides a safeguard against selecting Hires if you wish to preserve this area of memory.

K Heptinstall,
Blackpool, Lancs.

Error-free BBC programs

This program helps avoid mistakes when typing programs into a BBC micro. It gives a short bleep when lower case letters are entered.

It differs from other programs of this type as it uses the

keyboard vector OSRDCH leaving the 'events' vector free.

With OS 1.2, *FX 214,1 shortens the bleep, while *FX 212,216 or 212,232 softens it. The rest of the listing works with all versions of the OS. *FX210,1 turns all sounds off.

H Hoffman,
London E9.

```
10 *K. 10?&210=0: ?&211=9: *FX214,1: M
20 VEC=!&210 AND &FFFF: IF VEC=&900 END
30 FOR P=0 TO 2 STEP 2
40 P%=&900: [ OPTP
50 CMP#(ASC"a"): BCC E
60 CMP#(ASC"z"+1): BCS E
70 LDA#7: JSR&FFEE
80 .E JMP VEC
90 J: NEXT P
100 REM_RUN then press BREAK
```

Golden tip for Memotech silence

Having tried the save/load screen routines for the Memotech in the November 17 issue, I have discovered that the computer carries on making noises even after all the data

has been transferred to tape.

To stop this try inserting the following lines of code after the CALL £AAE instructions:

```
LD A,£9F
OUT(6),A
IN A,(3)
Julian Barkway,  
Chandlers Ford, Hants.
```

Now BASIC can do more . . .

fast data handling
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BASIC TOOLKIT

Improve your programming skills with these toolkit listings from Stuart Nicholls.

This program is intended to help both Basic and machine language programmers to develop and produce their working programs. It has five routines to achieve this aim.

1. Renumber
2. Delete lines
3. Delete REMs
4. Create line 0 REM
5. Keep line 0 REM only

To call the program enter as a direct command:

RANDOMIZE USR 63400

but note that there must be a Basic program in memory before the utility is used. An error report 'Sorry...no Basic' will be printed if an attempt is made to use it without a Basic program being present.

Renumber

This option, as its name implies, will renumber a Basic program from any line number to the end of the listing, and includes all the usual keywords, GOTO, GOSUB, RESTORE, LIST, LLIST and RUN.

It starts by asking you three questions:

● **From old line no.** — This can be any number from 0 to 9999 but defaults to 10 if Enter is pressed without entering a number. As with all inputs only numeric key presses are entered and after the entry of four figures only Delete or Enter is accepted. Numbers can be entered with or without leading zeros. The normal Break can be used at any time to return to the menu.

● **New line start no.** — This again can be in

the range 0 to 9999 with a default value of 10.

● **Step between lines** — This must be in the range 1 to 9999 and has a default value of 10.

After all three inputs have been entered, a check is made on the validity of each. If an entry is not acceptable then one of the following error messages will be printed:

Old line no. too large — the old line number exceeds the last line number of the Basic program.

New no. not valid — the new number is less than the old number and will overwrite an unchanged line.

Start/step size will overrange — a combination of start and step will cause the last line to exceed the maximum allowed of 9999.

Zero steps not allowed — a zero step size was entered.

Once all three values are accepted the program will be renumbered. You may see something similar to morse code on the screen, this is part of the program and should be ignored. The screen is used as a buffer to hold keyword addresses and values catering for approximately 1000 alterations to GOTO, GOSUB etc.

After renumbering, the routine returns to Basic and automatically lists your program.

There are several points to note with this routine. If a GOTO, GOSUB etc is

calculated the routine cannot recalculate for you but will highlight that particular keyword by making it flash. This will indicate that it should be amended. Edit the line and delete the two hidden characters before and after the keyword.

If a GOTO, GOSUB etc referred to a line number that did not exist but was within the program, this will be corrected by the routine and in renumbering will refer to the next line. If a GOTO, GOSUB etc referred to a line number above the largest in the program then, because when renumbering it may refer to a renumbered line, this will be highlighted by removing the number and replacing it with a flashing OTT.

The program will ignore keywords in the after REM statements and also in PRINT statements.

Once you have used the renumber routine, scan the listing for any of the above points and amend as necessary before running your program. Renumbering from a specified line allows

you to open holes in your listing for insertion of extra lines.

Delete lines

Should an area of a Basic listing require deleting, and if it is of such a size that it would be tedious to remove one line at a time, this option should be used. The input requirements are:

Delete from line no.

to line no. (inclusive).

You need a start and a finish line number, and the default is 10. It does not matter which number is entered first as the program sorts this out. However, an error message may be printed if the higher number exceeds the last Basic line number.

The lines deleted are inclusive, but note that if a line number is specified as the lower and that line does not exist then the next line will be taken, whereas a higher line number that does not exist will be taken as the previous line. So, for example, taking a program with a listing in steps of 10 from 100 to 1000 and

requiring deletion lines input as 875 to 359 will delete lines 360 to 870 inclusive.

This program is instantaneous and will list your remaining program on completion.

Delete REMs

Once this option is accepted it will automatically search your program and delete all REM statements whether in a multi statement line or on their own. REMs are helpful when producing programs but do slow down execution of Basic so it can sometimes be a benefit to remove them once a program is fully tested and working.

Create line 0 REM

This routine is of most use to machine code programmers who use an assembler which enters code directly into first line REM statements (the McGraw-Hill Assembler for example). If your code is several hundred bytes long it can take several minutes to set up the initial REM statement even using multi statement techniques.

Using this facility, all that is necessary is to enter the number of bytes required (0 to 9999) and, providing there is sufficient memory available, you will get an instant line 0 REM statement set up and listed.

Keep line 0 REM only

Should you have an assembler of the McGraw-Hill type, or even a simple hexloader program, this routine can be used to remove all the Basic listing except the first line which, if it is a REM statement, will be renumbered line 0.

The machine code

To enter the hex dump into the Spectrum a Basic hexloader must be used, so first enter the dual purpose Basic program as in Listing 1.

GOTO 100 allows the input of hex numbers in blocks of eight, with a checksum number which is the sum of the previous eight numbers modulo 256, and will detect most errors in inputs and allow that line to be re-entered. To end the input of hex numbers enter zz after the last checksum number.

GOTO 1000 will print, either to the screen or the printer, a hex dump with checksums of any block of memory. It can be used to check memory locations should the program fail to function as described in the instructions.

Once this Basic program has been typed in we are able to enter the machine code. First enter as a direct command CLEAR 63399 to ensure that the code will be safely poked in above RAMtop, then enter the hex numbers as in the hex dump. These numbers should be entered in blocks of 18 characters, ie eight two-character numbers and the checksum characters.

Remember there must be no spaces between characters so the first block will be entered as:

C3ACF9000000000069 ENTER

Listing 1

```

10 DEF FN a()=INT (y/16)
20 DEF FN b()=y-FN a()*16
30 DEF FN c()=INT (x/256)
40 DEF FN d()=x-FN c()*256
50 DEF FN e()=INT (t/256)
60 DEF FN f()=t-FN e()*256
70 DEF FN g(a$,b)=CODE a$(b)-4
8-7*(CODE a$(b)>57)
80 DEF FN h(a$)=16*FN g(a$,1)+
FN g(a$,2)
90 DEF FN c$(i)=CHR$(FN a()+48
+7*(FN a()>9))+CHR$(FN b()+48+7
*(FN b()>9))
100 PAPER 7: INK 0: CLS
110 LET r$=""
120 PRINT AT 11,7: FLASH 1:"REM
SET CAPS LOCK";AT 13,3:"HAVE YO
U CLEARED MEMORY?"
130 INPUT "Start address (DECIM
AL) ";adr
140 PAPER 7: INK 0: CLS
150 CLS: LET x=adr
160 LET y=FN c(): PRINT FN c$(i)
;
170 LET y=FN d(): PRINT FN c$(i)
180 INPUT "8 bytes + CHK. ";b$
190 IF b$="" THEN GO TO 180
200 IF b$="ZZ" THEN GO TO 450
210 LET st=adr
220 LET len=LEN b$: IF (INT (le
n/2))*2<len THEN PRINT "Odd no
. of chrs. ";: GO TO 410
230 IF len=18 THEN GO TO 250
240 IF b$(len-1 TO )<>"ZZ" THEN
PRINT "No 'ZZ' marker ";: GO T
O 410
250 FOR a=1 TO len-2: IF b$(a)<
"0" OR b$(a)>"F" THEN PRINT "In
valid chr. ";: GO TO 410
260 IF b$(a)<"A" AND b$(a)>"9"
THEN PRINT "Invalid chr. ";: GO
TO 410
270 NEXT a
280 LET x=0
290 FOR k=1 TO 8
300 LET a$=b$( TO 2): LET b$=b$
(3 TO )
310 IF b$="ZZ" THEN LET k=9: L
ET r$=b$: LET b$=a$: GO TO 360
320 PRINT a$;" ";
330 LET p=FN h(a$)
340 LET x=x+p
350 POKE adr,p: LET adr=adr+1
360 NEXT k
370 LET y=FN d(): PRINT "=";FN

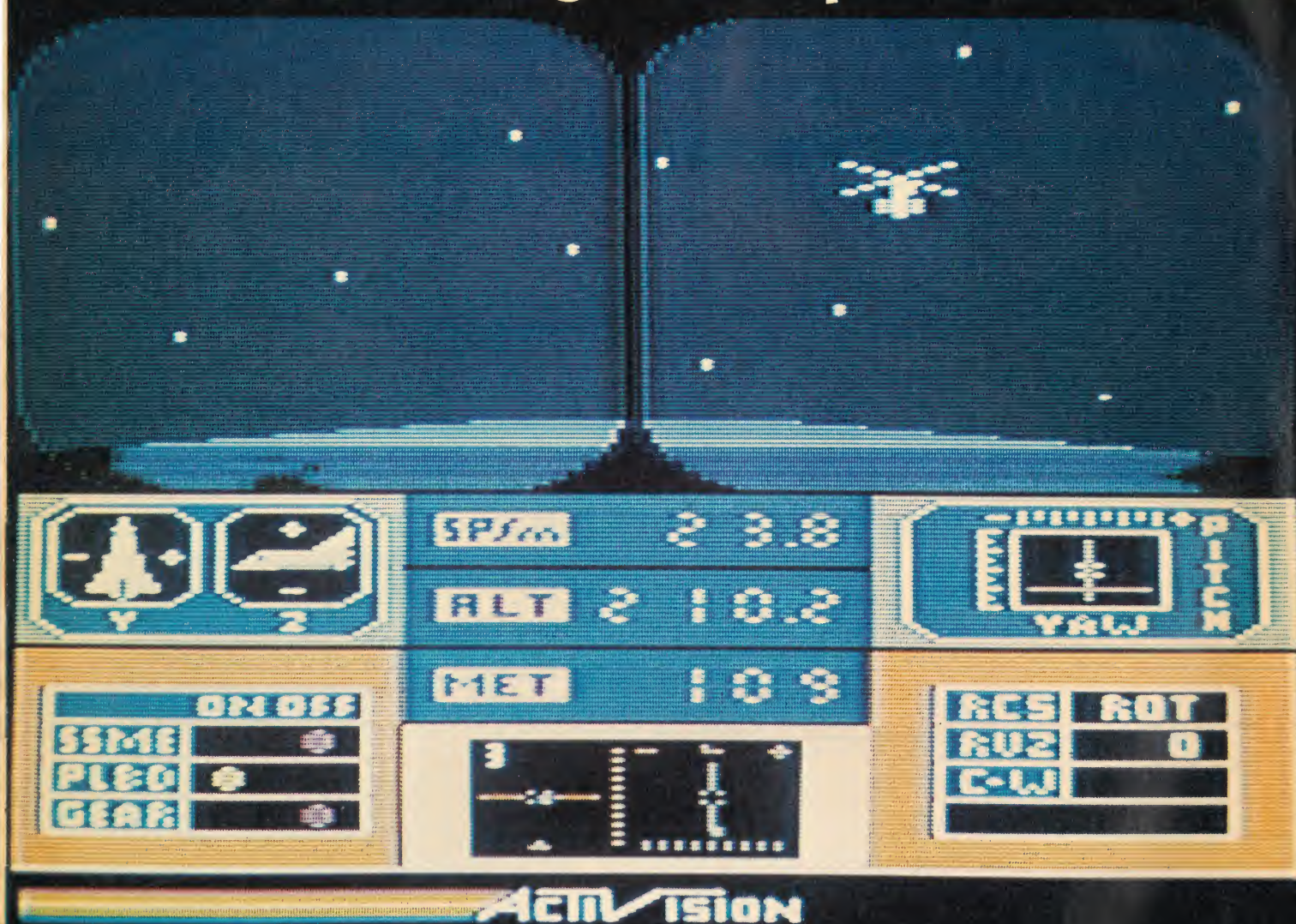
```

```

c$(i)"/";b$
380 LET a$=b$
390 IF y=FN h(a$) THEN GO TO 4
30
400 PRINT "Checksum ";
410 PRINT "error -re enter": BE
EP .25,5: BEEP .5,2: LET adr=st
420 GO TO 180
430 BEEP .1,20
440 IF r$<>"ZZ" THEN GO TO 150
450 PRINT "PROGRAM TERMINATED"
500
600
1000 PAPER 7: INK 0: CLS: LET p
=0
1010 INPUT "(S)creen OR (P)rinte
r ?";q$
1020 IF q$="P" OR q$="p" THEN L
ET p=1: GO TO 1040
1030 IF q$<>"S" AND q$<>"s" THEN
BEEP .5,2: GO TO 1010
1040 INPUT "From address (DECIMA
L) ";st
1050 INPUT "To address (DECIMAL)
";end
1060 PAPER 7: INK 0: CLS
1070 FOR x=st TO end STEP 8
1080 LET y=FN c(): IF p THEN LP
RINT FN c$(i): GO TO 1090
1085 PRINT FN c$(i);
1090 LET y=FN d(): IF p THEN LP
RINT FN c$(i): GO TO 1100
1095 PRINT FN c$(i)
1100 LET t=0
1110 FOR z=0 TO 7
1120 IF x+z>end THEN LET z=8: G
O TO 1150
1130 LET y=PEEK (x+z): LET t=t+y
1140 IF p THEN LPRINT FN c$(i);
";: GO TO 1150
1145 PRINT FN c$(i);" ";
1150 NEXT z
1155 LET y=FN f()
1160 IF p THEN LPRINT "=";FN c
$(i): GO TO 1170
1165 PRINT "=";FN c$(i);
1170 IF x+z>end THEN GO TO 1210
1180 IF p THEN LPRINT "ZZ": STO
P
1220 PRINT "ZZ"

```


You'd better get the hang of this. One day you might be up here for real.



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AVAILABLE FROM SELECTED BRANCHES OF BOOTS, WH SMITH, JOHN MENZIES, LASKY'S, SPECTRUM, RUMBELOWS, WOOLWORTH

OUTPUT: SPECTRUM

Once all the hex dump has been entered,
save the code using:
SAVE "UTILITY" CODE 63400,1952

Then check that the code functions
correctly as per the instructions. Enter
RANDOMIZE USR 63400 and check it out. If a
command does not work as described use

the Basic program (GOTO 1000) to com-
pare hex dumps (the quickest way is to
look at the checksum numbers) and
correct any mistakes.

Listing 2

```
F7A8 C3 AC F9 00 00 00 00 00 = 68
F7B8 16 0B 07 53 6F 72 72 79 = 47
F7C8 2E 2E 2E 2E 2E 6E 6F 20 = E3
F7D8 42 41 53 49 43 16 01 0B = 84
F7E8 14 01 4D 45 4E 55 14 00 = 5E
F7F8 16 04 06 31 2E 20 52 45 = 36
F808 4E 55 4D 42 45 52 16 06 = E5
F818 06 32 2E 20 44 45 4C 45 = A0
F828 54 45 20 4C 49 4E 45 53 = 34
F838 16 08 06 33 2E 20 44 45 = 2E
F848 4C 45 54 45 20 52 45 4D = 2E
F858 53 16 0A 06 34 2E 20 43 = 3E
F868 52 45 41 54 45 20 4C 49 = 26
F878 4E 45 20 30 20 52 45 4D = E7
F888 16 0C 06 35 2E 20 4B 45 = 3B
F898 45 50 20 20 20 4C 49 4E = D8
F8A8 45 20 30 20 52 45 4D 20 = B9
F8B8 4F 4E 4C 59 16 0E 06 36 = A2
F8C8 2E 20 52 45 54 55 52 4E = 2E
F8D8 20 54 4F 20 42 41 53 49 = 02
F8E8 43 16 0B 07 46 69 72 73 = FF
F8F8 74 20 6C 69 6E 65 20 6E = CA
F908 6F 74 20 52 45 4D 16 00 = FD
F918 01 4E 6F 2E 20 4F 46 20 = C1
F928 14 01 42 59 54 45 53 14 = B0
F938 00 20 39 39 39 39 20 4D = 71
F948 41 58 2E 16 11 09 14 01 = 0C
F958 00 14 00 20 54 4F 20 41 = 91
F968 43 43 45 50 54 16 13 09 = A1
F978 14 01 4E 14 00 20 54 4F = 3A
F988 20 43 41 4E 43 45 4C 01 = C7
F998 64 00 76 0B 78 B1 20 FA = 28
F9A8 C9 23 23 5E 23 56 23 19 = 22
F9B8 C9 78 B1 0B C8 76 1A 13 = 68
F9C8 D7 18 F6 CD 00 F9 11 78 = 37
F9D8 F8 01 24 00 CD B1 F8 01 = 94
F9E8 FE DF ED 78 CB 67 20 02 = 96
F9F8 37 C9 01 FE 7F ED 78 CB = AE
F908 5F 20 EC AF C9 2A 53 5C = BC
F918 ED 5B 4B 5C A7 E5 ED 52 = BA
F928 E1 C9 3E 02 CD 01 16 CD = 9B
F938 6B 0D 3E 02 CD 01 16 C9 = 65
F948 3E 16 D7 78 D7 79 D7 C9 = 93
F958 CD F8 F8 3E 14 D7 3E 01 = 25
F968 D7 3E 3E D7 3E 14 D7 AF = 02
F978 D7 C9 CD 00 F9 C5 21 AB = F7
F988 F7 E5 06 05 36 20 23 10 = 70
F998 FB E1 C1 0C CD AD FB FD = 1B
F9A8 CB 01 4E 28 FA FD CB 01 = 25
F9B8 AE CD C2 FB CD 54 1F D0 = 48
F9C8 3A 08 5C FE 0C 20 10 79 = 51
F9D8 FE 18 28 E0 0D 2B 36 20 = AC
F9E8 CD F8 F8 7E D7 18 D5 FE = FD
F9F8 0D 20 05 CD 7B F9 37 C9 = 73
F908 FE 30 38 C8 FE 3A 30 C4 = 5A
F918 5F 79 FE 1C 28 BE 73 CD = 18
F928 F8 F8 3E 13 D7 3E 01 D7 = 2E
F938 7E D7 3E 13 D7 AF D7 0C = 0F
F948 23 18 A9 79 FE 18 28 1F = BA
F958 EF A0 38 21 AB F7 7E FE = 06
F968 20 28 10 E5 D6 30 CD 28 = 38
F978 2D EF 01 A4 04 0F 38 E1 = ED
F988 23 18 EB CD A2 2D C9 3E = C9
F998 08 D7 3E 31 D7 3E 30 D7 = 6A
F9A8 01 0A 00 C9 3E 07 CD 9B = 81
F9B8 22 FD 36 53 38 CD DD F8 = 82
F9C8 20 00 0E CD EA F8 11 B0 F7 = 95
F9D8 01 15 00 CD B1 F8 AF C9 = 04
F9E8 CD EA F8 11 C5 F7 01 84 = 01
F9F8 00 CD B1 F8 01 FE EF ED = 51
F908 78 CB 67 C8 01 FE F7 ED = 55
F918 78 CB 47 CA DE FB CB 4F = 47
F928 CA 10 FB CB 57 CA 0D FA = 48
F938 CB 5F 28 40 CB 67 20 DC = C0
F948 01 04 0C CD BB F8 30 C8 = 89
F958 CD EA F8 2A 53 5C 23 23 = CE
F968 23 23 7E FE EA 28 0E 11 = F3
F978 49 F8 01 15 00 CD B1 F8 = CD
F988 CD 9F F8 18 AB 2A 53 5C = 00
F998 AF 77 23 77 2B CD B8 19 = 89
F9A8 2A 4B 5C CD E5 19 CD EA = 53
F9B8 F8 C3 F9 17 01 04 0A CD = A7
FA38 BB F8 30 8C CD EA F8 11 = 2F
FA48 5E F8 01 1D 00 CD B1 F8 = EA
FA58 01 17 00 CD 12 F9 D2 C8 = 8A
FA68 F9 2A 53 5C C5 01 06 00 = 9E
FA78 CD 55 16 23 AF 77 23 77 = 1B
FA88 C1 C5 C5 03 03 23 71 23 = 08
FA98 F0 23 36 EA 23 36 0D C1 = DA
FAA8 78 B1 20 07 C1 CD EA F8 = C0
FAB8 C3 F9 17 CD 55 16 C1 23 = EF
FAC8 36 30 0B 78 B1 20 F8 CD = 7F
FAD8 EA F8 C3 F9 17 01 04 08 = C2
FAE8 CD BB F8 D2 C8 F9 2A 53 = 90
FAF8 5C CD E0 F8 C3 D6 FA 23 = BE
FA08 23 5E 23 56 E5 19 EB E1 = C4
FA18 D5 ED 5B 5D 5C D5 11 EA = A6
FA28 FF CD 0B 19 D1 ED 53 5D = DE
FAB8 5C D1 30 03 23 18 DA 2B = A0
FAC8 7E FE 3A 28 0A 2B 2B 2B = 69
FAD8 13 EB CD E5 19 18 CA EB = 96
FAE8 CD E5 19 23 18 C3 CD EA = 80
FAD8 F8 2A 53 5C CD E0 F8 CA = 40
FAE8 F9 17 23 23 E5 23 54 5D = 0F
FAF8 23 7E CD B6 18 FE 0D 20 = 67
FAB8 F7 A7 ED 52 EB E1 73 23 = 3F
FAC8 72 23 19 18 DF 2A 53 5C = 7E
FAD8 CD E0 F8 20 02 37 C9 CD = 94
FAE8 00 19 D0 CD A9 F8 18 F0 = DF
FAB8 01 04 06 CD BB F8 D2 C8 = 25
FAC8 F9 CD EA F8 11 8A FB 01 = 3F
FAD8 23 00 CD B1 F8 01 17 00 = B1
FAE8 CD 12 F9 D2 C8 F9 ED 43 = 9B
FAB8 86 FB 01 17 01 CD 12 F9 = 72
FAC8 D2 C8 F9 ED 43 88 FB 2A = 70
FAE8 88 FB ED 5B 86 FB CD E4 = FD
FAB8 F8 30 08 EB ED 53 86 FB = DC
FAC8 22 88 FB 44 4D CD FD FA = FA
FAE8 30 05 2A 4B 5C 18 05 20 = 43
FAB8 03 CD A9 F8 22 88 FB ED = 03
FAC8 4B 86 FB CD FD FA 30 03 = C3
FAD8 2A 4B 5C 54 5D 2A 8B FB = 2F
FAB8 CD E4 F8 28 03 CD E5 19 = 9F
FAC8 CD EA F8 C3 F9 17 00 00 = 82
FAE8 00 00 44 45 45 45 45 = B3
FAB8 20 4C 49 4E 45 53 20 14 = CF
FAC8 01 44 52 4F 4D 00 16 01 = 59
FAD8 07 28 69 6E 63 2E 20 20 = E0
FAB8 20 54 4F 14 00 CD F8 F8 = 94
FAC8 E5 21 D6 FA 22 36 5C E1 = 6B
FAD8 3E 12 D7 3E 01 D7 3E 20 = 9B
FAB8 D7 C9 E5 21 00 3C 22 36 = 3A
FAC8 5C E1 CD F8 F8 3E 12 D7 = 21
FAD8 AF D7 3E 20 D7 C9 FF FF = 82
FAB8 C3 C3 C3 C3 FF FF C3 9A = 67
FAC8 FC 00 00 00 00 00 00 00 = FC
FAE8 00 00 00 00 00 00 01 = 15
FAB8 52 45 4E 55 4D 42 45 52 = 60
FAC8 14 00 0D 4F 4C 44 20 4C = 6C
FAD8 49 4E 45 20 4E 6F 2E 14 = FB
FAB8 01 53 54 41 52 54 14 00 = A3
FAC8 0D 4E 45 57 20 4C 49 4E = FA
FAD8 45 20 4E 6F 2E 14 01 53 = B8
FAB8 54 41 52 54 16 03 0C 20 = 80
FAC8 53 54 45 50 14 00 16 0B = 71
FAD8 00 4E 45 57 20 53 54 41 = F2
FAB8 52 54 20 4E 6F 2E 20 6E = 3F
FAC8 6F 74 20 76 61 6C 69 64 = 13
FAD8 16 0B 00 53 54 41 52 54 = AF
FAB8 2F 53 54 45 50 20 73 69 = 67
FAC8 7A 65 20 77 69 6C 6C 20 = D7
FAD8 4F 56 45 52 52 41 4E 47 = 64
FAB8 45 16 0B 00 4F 4C 44 20 = 65
FAC8 53 54 41 52 54 20 4E 6F = 68
FAD8 2E 20 74 6F 6F 20 6C 61 = 8D
FAB8 72 67 65 16 0B 00 5A 45 = FE
FAC8 52 4F 20 53 54 45 50 53 = 50
FAD8 20 6E 6F 74 20 76 61 6C = D4
FAB8 69 64 01 04 04 CD BB F8 = 56
FAC8 D2 C8 F9 CD EA F8 11 EE = 41
FAD8 FB 01 40 00 CD B1 F8 01 = B3
FAB8 17 01 CD 12 F9 30 E9 ED = F6
FAC8 43 E1 FB 01 17 02 CD 12 = 18
FCC8 F9 30 DD ED 43 E3 FB 01 = 15
FCC8 17 03 CD 12 F9 30 D1 78 = 6B
FCD8 B1 20 08 11 83 FC 01 17 = 81
FCE8 00 18 1F ED 43 E5 FB ED = 34
FCE8 4B E3 FB CD FD FA 38 1A = 3F
FCE8 56 23 5E 2A E1 FB EB A7 = 6F
FCF8 ED 52 30 0E 11 2E FC 01 = B9
FCF8 1A 00 CD B1 F8 CD 9F F8 = F4
FDD8 18 A1 ED 4B E1 FB CD FD = 97
FDD8 FA 30 08 11 69 FC 01 1A = C3
FDD8 00 18 E7 01 FF FF 03 CD = CE
FDD8 A9 F8 CD E0 F8 20 F7 78 = D5
FDD8 B1 28 1D 2A E3 FB ED 5B = 46
FDD8 E5 FB 19 0B 78 B1 20 FA = 47
FDD8 11 10 27 A7 ED 52 38 08 = 6E
FDD8 11 48 FC 01 21 00 18 BA = 49
FDD8 CD EA F8 21 00 40 22 EB = 1D
FDD8 FB 21 00 00 22 E7 FB 2A = 4A
FDD8 53 5C CD E0 F8 CA 5A FE = 76
FDD8 3A E8 FB A7 20 0C ED 4B = 28
FDD8 E1 FB CD 00 19 38 03 22 = 9F
FDD8 E7 FB 23 23 23 23 7E FE = EA
FDD8 EA 20 0C 23 7E CD B6 18 = 52
FDD8 FE 0D 20 F7 23 18 D3 CD = FD
FDD8 B6 18 FE 0D 28 F6 FE 3A = 2F
FDD8 28 E3 FE 22 20 08 23 7E = F4
FDD8 FE 22 20 FA 18 D7 FE E1 = 08
FDD8 38 D3 22 E9 FB 23 FE EC = 1E
FDD8 28 1D FE ED 28 19 FE E5 = 54
FDD8 28 0C FE F7 28 08 FE F0 = 47
FDD8 28 04 FE E1 20 B8 7E FE = 5F
FDD8 28 C1 FE 3A 28 AE 06 = 0A
FDD8 05 7E 23 FE 0E 28 09 CD = B0
FDD8 18 2D 38 16 10 F3 18 12 = C3
FDD8 05 78 32 ED FB 11 05 00 = AD
FDD8 19 7E FE 0D 28 32 FE 3A = 34
FDD8 28 2E 2A E9 FB 01 02 00 = 67
FDD8 CD 55 16 23 36 12 23 36 = FC
FDD8 01 23 23 01 02 00 CD 55 = 6C
FDD8 16 23 36 12 23 36 00 23 = FD
FDD8 7E CD B6 18 FE 0D CA 7C = 6A
FDD8 FD FE 3A CA 6D FD 18 EF = 70
FDD8 2B 2B 56 2B 5E E5 2A E1 = 25
FDD8 FB EB A7 ED 52 E1 30 0A = E1
FDD8 23 23 18 DB 3A ED FB 2A = 85
FDD8 E9 FB 06 00 4F A7 28 04 = 0C
FDD8 23 CD 55 16 06 04 23 36 = BE
FDD8 30 10 FB E5 ED 5B E9 FB = 4C
FDD8 2A EB FB 73 23 72 EB 01 = 04
FDD8 09 00 09 EB 23 1A 77 1B = CC
FDD8 1A 23 77 23 22 EB FB E1 = C0
FDD8 18 A5 2A EB FB 23 23 36 = 49
FDD8 FF 2A E7 FB CD E0 F8 CA = 7A
FDD8 DF FE 11 E1 FB 01 02 00 = CD
FDD8 ED B0 2A E7 FB 3A E4 FB = C2
FDD8 77 3A E3 FB 23 77 21 02 = 4C
FDD8 40 7E 3C 28 3A CD 2E FF = 56
FDD8 38 2F E5 36 00 2B 46 2B = 9E
FDD8 4E 03 2A E3 FB 11 E8 03 = 55
FDD8 CD 3C FF 11 64 00 CD 3C = 86
FDD8 FF 11 0A 00 CD 3C FF 7D = 9F
FDD8 C6 30 02 21 04 00 09 3A = 60
FDD8 E3 FB 77 3A E4 FB 23 77 = 08
FDD8 E1 23 23 23 23 18 C2 2A = 71
FDD8 E3 FB ED 5B E5 FB 19 22 = 41
FDD8 E3 FB 2A E7 FB 23 23 23 = 53
FDD8 7E CD B6 18 FE 0D 20 = 67
FDD8 F7 23 22 E7 FB 18 05 2A = E5
FDD8 EB FB 7C 85 FE 40 CA D6 = C5
FDD8 FA 2B 2B 7E 2B 56 2B 5E = D8
FDD8 22 EB FB FE 0B 28 21 EB = BA
FDD8 23 36 12 23 36 01 23 36 = 1E
FDD8 4F 23 36 2E 23 36 54 23 = A6
FDD8 36 2E 23 36 24 23 36 2E = 98
FDD8 23 36 12 23 36 00 18 C7 = A3
FDD8 62 6B 01 FF FF 03 13 1A = FC
FDD8 FE 30 28 F9 23 78 B1 28 = C3
FDD8 B6 CD E8 19 18 B1 E5 ED = 1F
FDD8 4B E1 FB 79 BE 20 03 23 = A4
FDD8 78 BE E1 C9 3E 2F A7 3C = 30
FDD8 ED 52 30 FA 19 02 03 C9 = 50
ZZ
```


SMOOTH OPERATOR

Alan Turnbull outlines some machine code utilities which help make more of QDOS operations

The flow of information about QDOS, the QL operating system, has been only a trickle. As well as being handy utilities, the machine code routines given here show how to make the best use of the QDOS manual, which has done something to spread the knowledge.

The utilities fall into four categories:

- A new SuperBasic procedure called **BOOT** which, when called like other SuperBasic procedures, attempts to 'bootstrap' the QL from Microdrive 1 as normally happens upon power-up or reset. This procedure may be used in applications programs or as an abbreviated form of the direct command **LRUN mdv1 boot**.

- A new SuperBasic procedure called **RESET** which, used in applications programs, provides the facility to simulate pressing the reset button (as used in the Psion software suite).

- A procedure **SWITCH** which allows the user to toggle between modes 4 and 8 and the QL screen from within a SuperBasic program.

- An interrupt server which scans the QL keyboard 50/60 times per second and tests if Function key F3 is pressed. If so, it calls the **SWITCH** routine to change the screen mode. When the routine is loaded, the key F3 acts in a similar manner to **CAPS LOCK**.

For full details, consult your QDOS manual.

BOOT

This procedure tests whether the QL it's running on is an 'AH' or 'JM' version by reading the QDOS release number: 1.02 for 'AH'; 1.03 for lucky 'JM' owners. (Actually, there are only minor differences between releases 1.02 and 1.03 of QDOS, and they will not affect the execution of applications software).

The routine loads the relevant 'booting' address and jumps to the ROM routine. While the QL searches Microdrive 1 for the file 'mdv1 boot', the QL screen is cleared down and the message "Attempting to boot off Microdrive 1" is displayed.

Note that what **BOOT** actually does is

an **MRUN**, so make sure any program currently in the memory is either deleted by **NEW** before **BOOT** is called or is effectively deleted by the overlaying file 'mdv1 boot'.

RESET

This fairly simple routine took some time to work out. It is no use just calling the initialisation routine from Basic with something like **CALL 360** (or **CALL PEEK-L(4)**, for the pedantic). When you do this, the Motorola MC68008 is running in user mode. To do the reset correctly, the MC68008 must be in supervisor mode.

This can be arranged by doing a **TRAP #0**, which discards the special QDOS return address, and then load the MC68008 Processor Status Word with the correct bit-pattern.

This Processor Status Word is arranged as two bytes: the user byte and the system byte. The user byte holds the usual, application program-related flags such as zero, overflow, carry, etc. The system byte, however, holds flags

Listing 1

```
00100 LEA PROC_DEF(PC),A1 ; point to procedure table
00110 MOVE.W $110,A2 ; QDOS vector to link-in procedures
00120 JSR (A2) ; call link-in routine
00130 BSR INTS ; set up 50/60 Hz interrupt server
00140 RTS ; return to SuperBASIC
00150 PROC_DEF: DC.W 3 ; number of procedures
00160 DC.W BOOT-* ; offset of boot routine
00170 DC.B 4,'BOOT',0 ; name of procedure
00180 DC.W RESET-* ; offset of reset routine
00190 DC.B 5,'RESET' ; name of procedure
00200 DC.W SW_MODE-* ; offset of switch routine
00210 DC.B 6,'SWITCH',0 ; name of switch procedure
00220 DC.W 0 ; end of procedure declarations
00230 DC.W 0 ; number of functions
00240 DC.W 0 ; end of function declarations
00250 BOOT: MOVEQ #0,D0 ; signal: get QDOS system info
00260 TRAP #1 ; 'manager' call
00270 MOVE.L #19392,A1 ; set up boot address for VER$ 'JM'
00280 CMPI.L #'1.03',D2 ; QDOS version 1.03 (QL VER$ 'JM')?
00290 BEQ DO_BOOT ; yes: so do the boot
00300 MOVE.L #19328,A1 ; set up boot address for VER$ 'AH'
00310 DO_BOOT: MOVE.L #131072,A2 ; clear screen down
00320 MOVE.L #8192,D0 ;
00330 FILL: MOVE.L #0,(A2)+ ;
00340 DBRA DO,FILL ;
00350 MOVE.L A1,-(A7) ; save boot address
00360 SUB.L A0,A0 ; signal: use command channel
00370 LEA MESSG(PC),A1 ; point to message
00380 MOVE.W $D0,A2 ; QDOS vector for message writing
00390 JSR (A2) ; call message printing routine
00400 MOVE.L (A7)+,A1 ; retrieve boot address
00410 JSR (A1) ; do the boot!
00420 MESSG: DC.W 36 ; message for booting
00430 DC.B 'Attempting to boot off Microdrive 1',10
00440 RESET: TRAP #0 ; go into supervisor mode
00450 MOVE #$2700,SR ; set up processor status word
00460 MOVE.L $4,A0 ; QDOS system reset vector
00470 JSR (A0) ; do reset!
00480 SW_MODE: MOVEQ #$10,D0 ; QDOS vector for screen mode
```

Listing 1 cont

```
00490 MOVE.B #-1,D1 ; read 4/8 mode flag
00500 MOVE.B #-1,D2 ; read RGB/UHF flag
00510 TRAP #1 ; do the read
00520 EOR.B #8,D1 ; toggle 4/8 mode flag
00530 MOVE.B #-1,D2 ; leave RGB/UHF flag
00540 MOVEQ #$10,D0 ; set screen mode
00550 TRAP #1 ; call QDOS routine
00560 RTS ; return to caller
00570 INTS: MOVEQ #$1C,D0 ; set up 50/60 Hz int server vector
00580 LEA LINK(PC),A0 ; set up link
00590 LEA INT(PC),A1 ; point to server
00600 MOVE.L A1,4(A0) ; save pointer in second long word
00620 TRAP #1 ; link in server
00630 RTS ; return to caller
00640 INT: MOVEQ #$11,D0 ; Send command to i8049
00650 LEA IPC_CMD(PC),A3 ; set up pointer to command
00660 TRAP #1 ; do it!
00670 CMPI.B #16,D1 ; is F3 pressed?
00680 BEQ SW_MODE ; yes: change screen mode
00690 RTS ; otherwise no action
00700 IPC_CMD: DC.B 9 ; command number: read keyboard row
00710 DC.B 1 ; number of parameters for command
00720 DC.L 0 ; amount of each byte significant
00730 DC.B 0 ; key row number
00740 DC.B 2 ; signal one byte reply
00750 LINK: DS.L 2 ; reserve interrupt link space
```

for trace mode, supervisor/user mode and the interrupt masks.

In fact, the whole Processor Status Word is arranged as follows:

User byte (least significant)

Bit 0: Carry;

Bit 1: Overflow;

Bit 2: Zero;

Bit 3: Negative;

Bit 4: Extend;

Bit 5-7: not used.

System byte (most significant)

Bits 0-2: Interrupt mask;

Bits 3-4: not used;

Bit 5: Supervisor/user mode select;

Bit 6: not used;

Bit 7: Trace mode select.

For a proper system reset the user byte should be set to zero and the system byte to 00100111 (binary) in order to signal supervisor mode and enable all interrupts.

This means that the 16-bit value placed in SR, the Processor Status Word, should be 0010011100000000 (binary) or 2700 (hex).

SWITCH

This routine simply reads the current screen mode (4- or 8- colour — stored as code 0 or 8) and toggles it by 'Exclusive-OR'ing the value read with 8. This new value is then sent back to set the new screen mode. The whole operation is carried out by using the same QDOS **TRAP**.

Interrupt Server

The addition of the 50/60 H3 interrupt-server routine to the QL's operating system provides a screen mode toggle switch, similar in function to **CAPS LOCK**.

The interrupt server simply examines

the Function key F3 every time a screen frame is displayed to see if it is depressed. This is done by communication with the QL's secondary processor chip (IPC) — the Intel i8049. The QDOS Manual should be studied for the IPC communication command format.

Adding the new features

You have a choice of what to do. You could assemble the Motorola format assembly listing in Listing 1, save the code generated (position independent) to a Microdrive file, say, 'mdv2_listing1', reset the QL, and type in:

LET reserved address=RESPR(256)

LBYTES mdv2_listing1, reserved_address

CALL reserved address

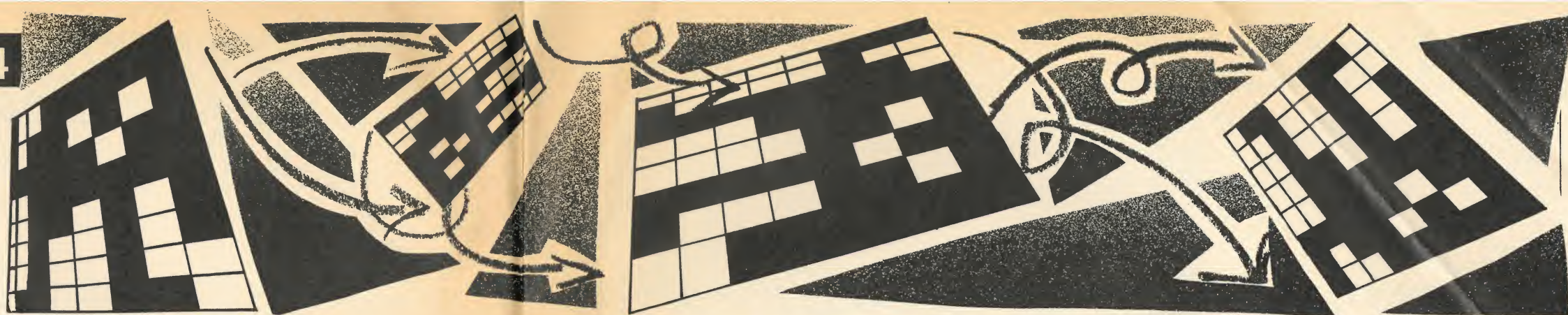
On the other hand you could type in, save to Microdrive, reset the QL, and **LRUN** the program in Listing 2. ■

Listing 2

```
100 REMark SuperBASIC program to add useful utilities to the Sinclair QL
110 REMark COPYRIGHT (c) December 1984, Alan Turnbull
120 :
130 LET reserved_address=RESPR(256)
140 LET offset=0
150 REPEAT read_data
160 IF EOF THEN EXIT read_data
170 READ data_byte
180 POKE reserved_address+offset,data_byte
190 LET offset=offset+1
200 END REPEAT read_data
210 CALL reserved_address
220 :
230 DATA 67,250,0,14,52,120,1,16,78,146,97,0,0,178,78,117,0,3,0,32,4,66,79,79,84,
0,0,126,5,82,69,83,69,84,0,130,6,83,87,73,84,67,72,0,0,0,0,0,112,0,78,65,34,
124,0,0,75,192,12,130,49,46,48,51,103,6,34,124,0,0,75,128,36,124,0,2,0,0,32,60,
0,0,32,0,36,252,0,0,0,0,81,200,255,248,47,9,145,200,67,250,0,12,52,120,0,208,78,
146,34,95,78,145,0,36,65,116,116,101,109,112,116,105,110,103,32,116,111,32,98,11
1,111,116,32,111,102,102,32,77,105,99,114,111,100,114,105,118,101,32,49,10,78,64,
70,252,39,0,32,120,0,4,78,144,112,16,18,60,0,255,20,60,0,255,78,65,10,1,0,8,20,
60,0,255,112,16,78,65,78,117,112,28,65,250,0,38,67,250,0,10,33,73,0,4,78,65,78,1
17,112,17,71,250,0,12,78,65,12,1,0,16,103,198,78,117,9,1,0,0,0,0,2,0,0,0,0,0,0,
0,0
```


SPRITE GYMNASTICS

Put an extra spring into the movement of your 64's sprites with this sprite handling program from Barry Thomas.



The Commodore 64 is famous for its sprites and although Commodore Basic has no commands to give you direct control over them, they are fairly simple to set up and use. Just make a design on a 24x21 grid, convert the binary patterns to decimal numbers, and they can be poked into position at a suitable place in memory, ready for use. So far, so fine and dandy, but these sprites can appear a little pedestrian if all they can be made to do is scuttle to and fro across the screen. What's needed is a little more athleticism.

The program shown here supplies that extra something. It enables you to: change sprite colours at the drop of a hat; toggle any of them on or off with a simple command; turn any sprite upside down or reverse it or even get a whole new block of data for a new sprite.

The bulk of the program comprises five Basic loaders, which poke machine code instructions into a 4K block of memory high up in memory where they will be safe from Basic. Once there, they can be called by the sys command whenever needed.

So, the large subroutine between lines 1000 and 1610 contains these five loaders, all clearly labelled. If your particular application just needs sprites that can turn upside down, you can hijack the relevant section from that subroutine, the sprite inverter at lines 1360-1470. The subroutine from line 2000 onwards simply sets up a sprite to contain pictures of Glob and Blob.

This data is stored at addresses 832 to 894, block 13 in the memory map. (That is, 13 blocks of 64 bytes up from address 0, because $13 \times 64 = 832$). As this area of memory is used by the system only when loading from or saving to cassette, it's usually quite safe. However, if you are using the datasette during your program you must put your data somewhere else.

The rest of the program, between lines 10 and 150 sets up a menu on the screen and prompts you to select from six courses of action. These are the five machine code routines and the option to quit the program. All the routines run independently.

Using each routine

Choice 1 on the menu enables you to change the colour of a sprite. First, specify the sprite number, and the colour number. The sprite number in this program is always 0 since only one sprite is set up for action. The colours are from the usual Commodore selection where 0=Black, 1=White and so on. To use this machine code routine, we must type, or include in a program, the instruction: SYS 50265,SN,CN where SN is the Sprite Number (from 0-7), and CN is the Colour Number (from 0-15).

The instruction may be typed in with real numbers for the SN and CN, or as above with variables. The commas must be included or the routine jumps to the error message table in ROM. The

working of the routine is quite simple: it looks for the first comma, then checks that the sprite number is not greater than seven. This being so, the next comma is checked for. The colour number must be in the appropriate range, and provided all is in order, with the operands supplied along with the SYS address, the Colour Number is placed in the appropriate place in the registers of the VIC II chip.

Choice 2 on the menu is to reverse the sprite. This process just turns the data in the sprite about-face, so if your sprite contained, eg a train facing right, it would be facing left after the sprite had been reversed. Simple, innit?

The workings of this routine are a little more complex than the first. No sprite number is specified when you use the routine—instead, the address of the start of the data for the sprite to be reversed must be poked into two addresses in page 0 memory. These will act as a pointer which the routine can refer to.

So, in this program, the data for sprite 0 is located in addresses 832 onwards, and the low and high bytes of this number must be poked into locations 253 and 254 respectively. In hexadecimal, 832 is \$0340. The low byte, \$40, converts into decimal 64 and can be poked into location 253. The high byte is \$03 which, of course, remains the same in decimal and can be poked into location 254. This occurs in the main program on line 110. Once this is done, the SYS instruction can be used thus: SYS 49770

The sprites are, of course, three bytes wide, and the routine works by taking the first byte on a row and reversing it. This byte is then put into temporary storage on the stack in page 1 memory. The second byte on the row is then reversed in the same way, and put back just where it came from in the middle position in the row. Next, the third byte is reversed and placed in the position where the first byte was taken from. This leaves just the original byte 1 to be taken from the stack and put in the right most position on the row.

In fact, this isn't as complex as it sounds. Try it out with a pictorial view of three bytes in a row on a piece of paper. That's how each row of three bytes is treated, but there are 21 rows, and each must be done in turn. If that sounds like a lengthy number crunch, the routine does, in fact, work so fast it all seems to happen at once. Pretty effective it is too.

Number three on the menu is the matching pair to the last routine because it turns the contents of the sprite upside down. This one works by taking the top row of three bytes, putting them into storage, and replacing them with the three bytes that form the bottom row of the sprite. This done, the original three bytes can be put into position on the bottom row. The next step is to take the second row down and the second row up and swap them around in exactly the same way, and so on. When the middle row is reached, row 11, it is left exactly as it is.

The syntax for using the routine is simply SYS 49840.

As with the last routine, the address of the start of the sprite data must be put into addresses 253 and 254 in page 0 to act as a pointer. Both routines use that pointer in a non-destructive way, ie when the routine has done its job, the pointer is still where you put it, so the routine can be used again without having to put the two numbers in position again.

The only problem is that since page 0 memory is at such a premium, due to the system using almost all of it, the other routines use the same two bytes as pointers too. So, if you put your pointer into page 0, use the reverser routine and then the colour change routine on a different sprite. Don't expect your pointer to be safe and sound later on—it won't.

The third item on our menu is the sprite toggler. This lets you switch a sprite on or off, without even knowing which state it is in when you start. If the sprite is off, it will be turned on, and vice versa. It operates on the sprite switch location in the VIC II chip in exactly the same way as can be done from Basic. The difference is that you must remember one address, that is the start of the routine, and know which sprite you want to toggle. To use the routine, just type: SYS 50215, SN. As usual, the comma must be present, and SN is either a real number or a variable designating the number of the sprite to be toggled.

Last on the list is a routine to grab 63 bytes of data from anywhere in memory and put them into the space allotted for any particular sprite. This comes in handy when your particular application means using several different sprites. As the VIC II chip can only 'see' 16K of memory at once, all eight sprites in use at any one time must be in the particular 16K bank of memory currently in use.

Finding room for all these sprites can be a problem. It makes sense to put the sprite data out of the way in high memory, and just grab the data for a new sprite as and when it's needed. The sprite data can be stored safely in the 4K block of memory where I have put these five routines. (Between \$C000 and \$CFFF) That's enough storage space for another 64 sprites. The routine is accessed with the instruction: SYS 50315,SA,SN where SA is again a real number or a variable for the start address of the new data, wherever you have chosen to store it. SN is of course the sprite number.

As usual, the commas are checked for, and all the routine does is transfer a block of 63 bytes, one by one, from the address specified to the address allocated to contain the data for the selected sprite. Hence, a grand total of 271 bytes of machine code can give that extra bit of pizzazz to ordinary sprites.

These routines remain the copyright of Barry Thomas 1984. All, and more, feature in Barry's new book *Supercharge Your Commodore 64* published at £6.95 by Melbourne House.

Listing

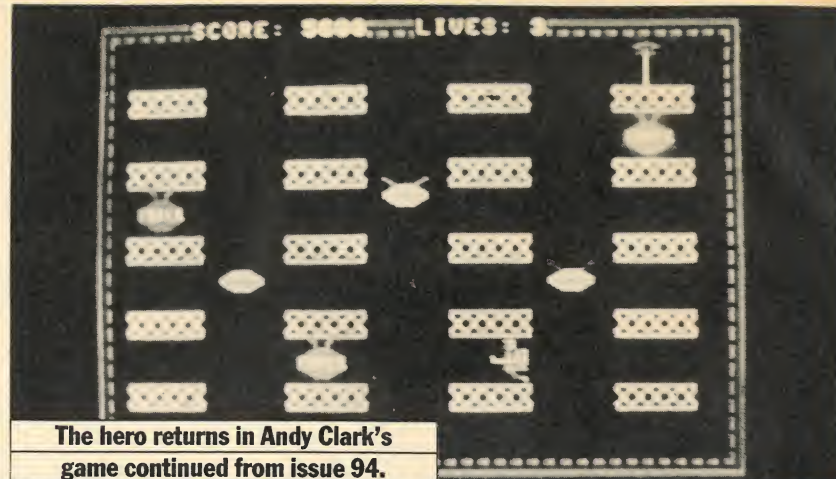
```
10 PRINT"[CLEAR]"
20 POKE 53249,170:POKE 53277,255:POKE 53
271,255:POKE 53248,255:POKE 2040,13
25 GOSUB 1000:GOSUB 2000:POKE 53269,255
30 PRINT:PRINT" THIS IS GLOB AND BLOB..
."
40 PRINT" THESE ARE THE CHOICES"
50 PRINT:PRINT" 1.CHOOSE A NEW COLOUR"
:PRINT" 2.REVERSE THE SPRITE":
60 PRINT" 3.INVERT THE SPRITE":PRINT"
4.TOGGLE THE SPRITE ON OR OFF"
70 PRINT" 5.GET NEW SPRITE DATA":PRINT
" 6.QUIT"
80 PRINT:INPUT"WHICH OPERATION";C
90 IF C<1 OR C>6 THEN GOTO 80
100 IF C=1 THEN INPUT"COLOUR NUMBER";CN:
SYS 50265,0,CN:PRINT"[CLEAR]":GOTO 40
110 IF C=2 THEN POKE 253,64:POKE 254,3:S
YS 49770:PRINT"[CLEAR]":GOTO 40
120 IF C=3 THEN POKE 253,64:POKE 254,3:S
YS 49840:PRINT"[CLEAR]":GOTO 40
130 IF C=4 THEN SYS 50215,0:PRINT"[CLEAR
]":GOTO 40
140 IF C=5 THEN INPUT"START ADDRESS";SA:
SYS 50315,SA,0:PRINT"[CLEAR]":GOTO 40
150 PRINT"[CLEAR]":END
```

```
900 END
1000 REM
1010 REM-----NEW DATA LOADER-----
1020 REM
1030 FOR X=50315 TO 50380
1040 READ A:POKE X,A:NEXT X
1050 DATA 32,253,174,32,138,173,32,247
1060 DATA 183,132,251,133,252,32,253
1070 DATA 174,32,138,173,32,247,183,201
1080 DATA 0,208,34,133,253,133,254,192
1090 DATA 8,176,26,185,248,7,240,24,133
1100 DATA 253,162,6,6,253,38,254,202
1110 DATA 208,249,160,63,177,251,145
1120 DATA 253,136,16,249,96,76,72,178
1130 DATA 76,69,178
1140 REM
1150 REM-----COLOUR SETTER LOADER-----
1160 REM
1170 FOR X=50265 TO 50310
1180 READ A:POKE X,A:NEXT X
1190 DATA 32,253,174,32,138,173,32,247
1200 DATA 183,201,0,208,30,192,8,176,26
1210 DATA 132,251,32,253,174,32,138,173
1220 DATA 32,247,183,201,0,208,11,192
1230 DATA 16,176,7,152,164,251,153,39
1240 DATA 208,96,76,72,178
```

```
1250 REM
1260 REM-----SPRITE TOGGLER LOADER-----
1270 REM
1280 FOR X=50215 TO 50257
1290 READ A:POKE X,A:NEXT X
1300 DATA 32,253,174,32,138,173,32,247
1310 DATA 183,201,0,208,27,192,7,176,23
1320 DATA 162,1,134,252,192,0,240,6,6
1330 DATA 252,136,24,144,246,173,21,208
1340 DATA 69,252,141,21,208,96,76,72,178
1350 REM
1360 REM-----SPRITE INVERTER LOADER-----
1370 REM
1380 FOR X=49840 TO 49891
1390 READ A:POKE X,A:NEXT X
1400 DATA 162,29,134,251,160,35,132,252
1410 DATA 169,3,133,2,164,251,177,253
1420 DATA 72,164,252,177,253,164,251,145
1430 DATA 253,104,164,252,145,253,198
1440 DATA 251,198,252,198,2,208,230,165
1450 DATA 251,48,9,165,252,24,105,6,133
1460 DATA 252,208,213,96
1470 REM
1480 REM-----SPRITE REVERSER LOADER-----
1490 REM
1500 FOR X=49770 TO 49836
```

```
1510 READ A:POKE X,A:NEXT X
1520 DATA 160,0,177,253,32,143,194,72
1530 DATA 200,177,253,32,143,194,145
1540 DATA 253,200,177,253,136,136,32
1550 DATA 143,194,145,253,200,200,104
1560 DATA 145,253,200,192,63,208,222,96
1570 DATA 162,0,134,251,232,134,252,162
1580 DATA 8,24,10,144,9,72,24,165,252
1590 DATA 69,251,133,251,104,6,252,202
1600 DATA 208,238,165,251,96
1610 RETURN
2000 REM
2010 REM-----SPRITE SETUP-----
2020 REM
2030 FOR X=832 TO 894
2040 READ D:POKE X,D:NEXT X
2050 DATA 3,224,0,31,248,0,63,254,0,63
2060 DATA 255,128,115,231,128,115,231
2070 DATA 192,255,255,192,255,255,128
2080 DATA 252,159,128,112,134,56,124,30
2090 DATA 124,127,252,124,31,252,254,31
2100 DATA 248,214,7,240,214,3,97,215,3
2110 DATA 97,255,3,97,255,3,97,255,7,113
2120 DATA 147,15,121,147:RETURN
```


BRUCE IS BACK



The hero returns in Andy Clark's game continued from issue 94.

Listing (cont)

```
2036 PRINT"[HOME][DOWN][DOWN][DOWN][DOWN]
[RIGHT][RIGHT][RIGHT][RIGHT][RIGHT][CYA
N]ANOTHER GO?"
2038 PRINT"[RIGHT][RIGHT][RIGHT][RIGHT][
RIGHT]PRESS [c 3]'FIRE'[CYAN] FOR [c 3]Y
ES"
2040 PRINT"[RIGHT][RIGHT][RIGHT][RIGHT][
RIGHT][CYAN]PRESS [c 3]'N' [CYAN]FOR [c
3]NO"
2042 GETA$:IFPEEK(56321)=239THENPOKEV+21
,0:CLR:RESTORE:PRINT"[CLEAR]":RUNB
2044 IFA$<>"N"THEN2042
2046 PRINT"[CLEAR]":POKEV+33,6:POKEV+32,
14:END
2999 END
20000 REM***SONG*****
20010 DATA6.0,0.7,9.11,9.9,0,-1
30000 REM***BRUCE RIGHT 1
30001 DATA0,0,0,0,84,0,0
30002 DATA88,0,0,104,0,0,124
30003 DATA0,21,48,0,25,168,0
30004 DATA25,184,0,25,184,16,25
30005 DATA127,240,25,85,80,21,168
30006 DATA0,4,168,0,21,84,0
30007 DATA0,168,0,0,168,0,0
30008 DATA160,0,0,128,0,0,64
30009 DATA0,0,64,0,0,80,0
30010 REM***BRUCE RIGHT 2
30011 DATA0,0,0,0,84,0,0
30012 DATA88,0,0,104,0,0,124
30013 DATA0,21,48,0,25,168,0
30014 DATA25,184,0,25,184,16,25
30015 DATA127,240,25,85,80,21,168
30016 DATA0,4,168,0,21,84,0
30017 DATA0,168,0,0,160,0,2
30018 DATA128,0,22,128,0,16,0
30019 DATA0,0,0,0,0,0,0
30020 REM***BRUCE LEFT 1
30021 DATA0,0,0,0,84,0,0
30022 DATA148,0,0,164,0,0,244
30023 DATA0,0,49,80,0,169,144
30024 DATA0,185,144,16,185,144,63
30025 DATA249,144,21,85,144,0,169
30026 DATA80,0,168,64,0,85,80
30027 DATA0,168,0,0,168,0,0
30028 DATA40,0,0,8,0,0,4
30029 DATA0,0,4,0,0,20,0
30030 REM***BRUCE LEFT 2
30031 DATA0,0,0,0,84,0,0
30032 DATA148,0,0,164,0,0,244
30033 DATA0,0,49,80,0,169,144
30034 DATA0,185,144,16,185,144,63
30035 DATA249,144,21,85,144,0,169
30036 DATA80,0,168,64,0,85,80
30037 DATA0,168,0,0,40,0,0
30038 DATA10,0,0,0,10,80,0,0
30039 DATA16,0,0,0,0,0,0
30040 REM***BRUCE UP
30041 DATA0,0,0,0,84,0,0
30042 DATA84,0,0,84,0,0,220
30043 DATA0,0,116,0,1,85,0
30044 DATA13,101,192,77,169,196,253
30045 DATA101,252,85,85,84,0,84
30046 DATA0,0,152,0,0,84,0
30047 DATA0,168,0,0,168,0,0
30048 DATA168,0,0,136,0,0,68
30049 DATA0,0,68,0,1,69,0
30050 REM***BRUCE DOWN
30051 DATA0,0,0,0,84,0,0
30052 DATA100,0,0,168,0,0,252
30053 DATA0,0,116,0,3,171,0
30054 DATA3,171,0,67,171,4,255
30055 DATA171,252,85,169,84,0,168
30056 DATA0,0,168,0,0,84,0
30057 DATA0,168,0,0,168,0,0
30058 DATA168,0,0,136,0,0,68
30059 DATA0,0,68,0,1,69,0
30060 REM***FUEL HANGING
30061 DATA2,0,128,2,0,128,2
30062 DATA0,128,2,130,128,0,130
30063 DATA0,0,130,0,0,170,0
30064 DATA2,170,128,10,170,160,42
30065 DATA170,168,249,155,230,233,155
30066 DATA166,249,155,230,233,155,166
30067 DATA233,91,229,170,170,170,42
30068 DATA170,168,10,170,160,2,170
30069 DATA128,0,170,0,0,0,0
30070 REM***FUEL STANDING
30071 DATA63,255,252,55,255,220,87
30072 DATA235,213,23,170,212,5,170
30073 DATA80,1,170,64,1,170,64
30074 DATA85,170,85,106,170,169,106
30075 DATA170,169,106,170,169,90,170
30076 DATA165,22,170,148,22,170,148
30077 DATA5,170,80,5,170,80,1
30078 DATA170,64,1,85,64,5,20
30079 DATA80,20,20,20,84,20,21
30080 REM***BRUCE NAME #1***
30081 DATA0,0,0,1,80,0,15
30082 DATA244,0,42,173,0,42,169
30083 DATA64,47,251,64,45,91,64
30084 DATA45,11,64,45,173,0,42
30085 DATA180,0,42,180,0,47,173
30086 DATA0,45,251,64,45,91,64
30087 DATA45,11,64,45,11,64,42
30088 DATA171,64,42,173,0,15,244
30089 DATA0,1,80,0,0,0,0
30090 REM***BRUCE NAME 2
30091 DATA0,0,0,0,0,0,0
30092 DATA0,0,0,0,0,21,0
30093 DATA0,170,64,130,170,67,142
30094 DATA150,147,142,145,147,142,145
30095 DATA147,142,150,147,142,170,147
30096 DATA142,170,67,142,169,3,142
30097 DATA154,67,142,154,67,142,150
30098 DATA67,142,146,67,254,146,67
30099 DATA254,0,64,170,0,0,0
30100 REM***BRUCE NAME 3
30101 DATA0,0,0,0,0,0,0
30102 DATA0,0,0,0,0,63,0
30103 DATA85,85,194,169,85,114,169
30104 DATA125,114,89,115,114,65,112
30105 DATA194,64,112,2,84,112,2
30106 DATA164,112,2,164,112,242,84
30107 DATA115,114,65,125,114,89,85
30108 DATA114,169,85,194,169,0,0
30109 DATA0,0,0,0,0,0,0
30110 REM***ALIEN SHIP
30111 DATA0,0,0,0,0,0,0
30112 DATA0,0,128,0,8,32,0
30113 DATA32,8,0,128,1,85,0
30114 DATA7,255,64,31,255,208,85
30115 DATA85,84,102,102,100,85,85
30116 DATA84,31,255,208,7,255,64
30117 DATA1,85,0,0,0,0,0
30118 DATA0,0,0,0,0,0,0
30119 DATA0,0,0,0,0,0,0
30120 REM***GIRL 1
30121 DATA0,0,0,2,160,0,2
30122 DATA176,0,2,240,0,10,240
30123 DATA0,42,192,0,1,91,0
30124 DATA1,144,0,1,171,0,1
30125 DATA80,0,1,80,0,2,160
30126 DATA0,1,80,0,1,80,0
30127 DATA5,84,0,21,85,0,21
30128 DATA85,0,3,48,0,3,32
30129 DATA0,2,40,0,2,128,0
30130 REM***SWORD
30131 DATA0,32,0,2,170,0,10
30132 DATA34,128,2,170,0,0,32
30133 DATA0,2,170,0,0,16,0
30134 DATA0,16,0,0,16,0,0
30135 DATA16,0,0,16,0,16,0
30136 DATA0,0,16,0,0,16,0
30137 DATA0,16,0,0,16,0,0
30138 DATA16,0,0,16,0,0,16
30139 DATA0,0,16,0,0,16,0
30140 REM***STAKE AND ROPES
30141 DATA168,0,0,168,0,0,168
30142 DATA0,0,168,0,0,168,0
30143 DATA0,168,0,0,85,64,0
30144 DATA168,0,0,85,88,0,168
30145 DATA0,0,85,88,0,168,0
30146 DATA0,85,80,0,168,0,0
30147 DATA85,64,0,168,0,0,85
30148 DATA0,0,168,0,0,85,0
30149 DATA0,168,0,0,168,0,0
30150 REM***DROID #1
30151 DATA0,0,0,0,0,0,3
30152 DATA255,192,15,255,64,15,255
30153 DATA128,15,255,64,3,255,192
30154 DATA0,48,0,0,48,0,0
30155 DATA48,0,0,48,0,0,252
30156 DATA0,0,252,0,0,252,0
30157 DATA0,252,0,0,252,0,0
30158 DATA252,0,0,48,0,0,48
30159 DATA0,0,252,0,3,255,0
30160 REM***DROID #2
30161 DATA0,0,0,0,0,0,1
30162 DATA85,0,1,169,0,1,169
30163 DATA0,1,169,0,1,85,0
30164 DATA0,48,0,0,48,0,0
30165 DATA48,0,0,48,0,0,252
30166 DATA0,0,252,0,0,252,0
30167 DATA0,252,0,0,252,0,0
30168 DATA252,0,0,48,0,0,48
30169 DATA0,0,252,0,3,255,0
30170 REM***DROID #3
30171 DATA0,0,0,0,0,0,15
30172 DATA255,0,7,255,192,11,255
30173 DATA192,7,255,192,15,255,0
30174 DATA0,48,0,0,48,0,0
30175 DATA48,0,0,48,0,0,252
30176 DATA0,0,252,0,0,252,0
30177 DATA0,252,0,0,252,0,0
30178 DATA252,0,0,48,0,0,48
30179 DATA0,0,252,0,3,255,0
30180 REM***ALIEN SHIP 2
30181 DATA0,0,0,0,0,0,0
30182 DATA0,0,0,0,0,32,0
30183 DATA32,8,0,128,2,2,0
30184 DATA1,85,0,5,85,64,21
30185 DATA253,80,22,170,80,21,253
30186 DATA80,21,85,80,1,85,0
30187 DATA0,0,0,0,0,0,0
30188 DATA0,0,0,0,0,0,0
30189 DATA0,0,0,0,0,0,0
30190 REM***ALIEN SHIP 3
30191 DATA0,0,0,0,0,0,0
30192 DATA0,0,0,0,0,0,0
30193 DATA0,8,0,128,2,2,0
30194 DATA0,136,0,1,85,0,5
30195 DATA85,64,5,253,64,5,85
30196 DATA64,1,85,0,0,0,0
30197 DATA0,0,0,0,0,0,0
30198 DATA0,0,0,0,0,0,0
30199 DATA0,0,0,0,0,0,0
30200 REM***ALIEN SHIP 4
30201 DATA0,0,0,0,0,0,0
30202 DATA0,0,0,0,0,0,0
30203 DATA0,0,0,0,2,2,0
30204 DATA0,136,0,0,32,0,0
30205 DATA84,0,1,117,0,0,84
30206 DATA0,0,0,0,0,0,0
30207 DATA0,0,0,0,0,0,0
30208 DATA0,0,0,0,0,0,0
30209 DATA0,0,0,0,0,0,0
30210 REM***ALIEN SHIP 5
30211 DATA0,0,0,0,0,0,0
30212 DATA0,0,0,0,0,0,0
30213 DATA0,0,0,0,0,0,0
30214 DATA0,0,0,0,136,0,0
30215 DATA32,0,0,84,0,0,0
30216 DATA0,0,0,0,0,0,0
30217 DATA0,0,0,0,0,0,0
30218 DATA0,0,0,0,0,0,0
30219 DATA0,0,0,0,0,0,0
```

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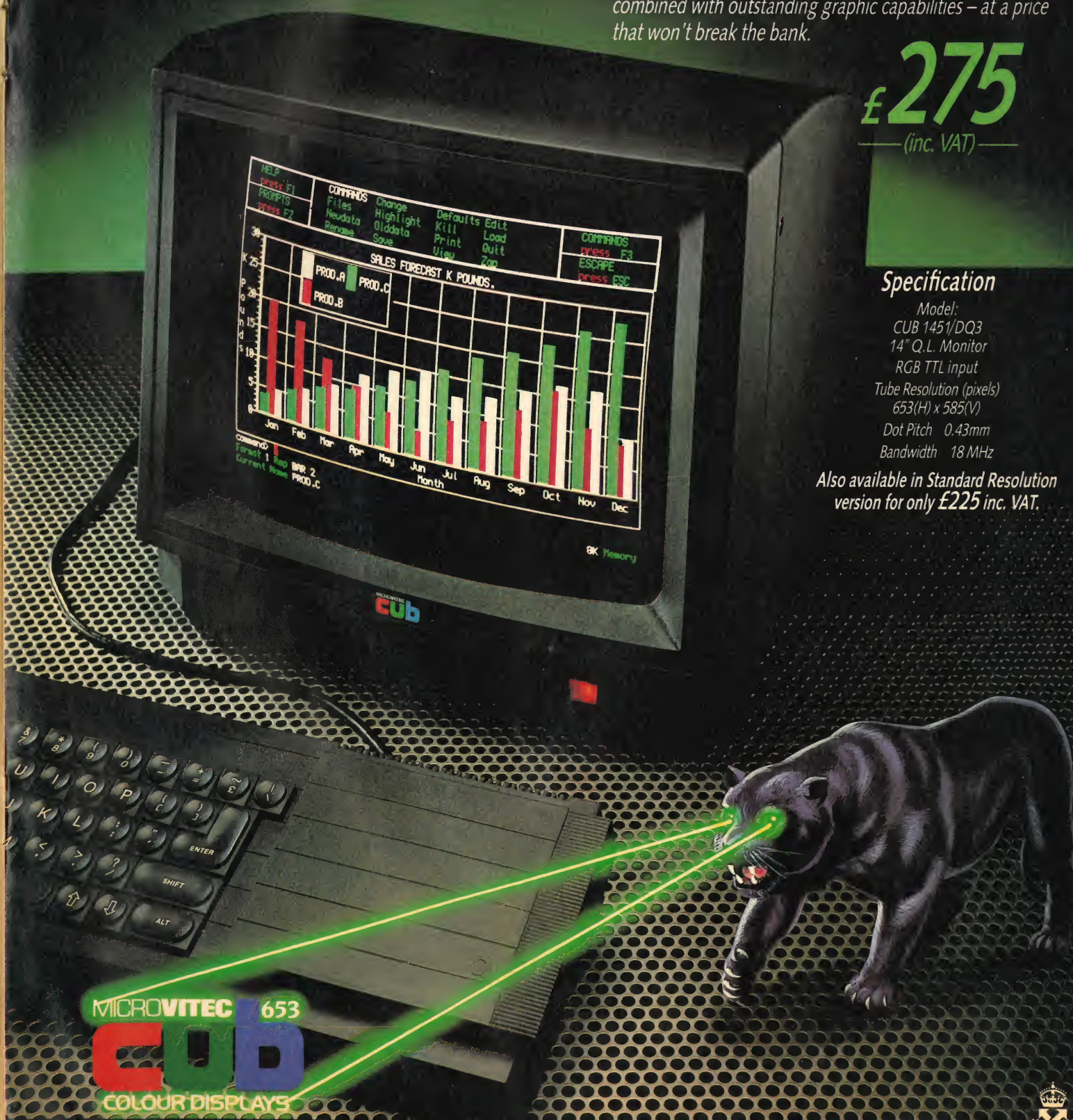
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Your expert skills as a docking pilot will certainly stand you in good stead, when you carefully guide your space shuttle on to the rugged terrain of an unknown planet.

This almost foolhardy mission is entirely in the interests of science. Two boffins have decided that they must alight and examine the area. Wary of dangerous chemical substances that may cover the planet's surface you intend to land on one of the two landing pads. This is easier said than done, especially as one is at the bottom of a very deep crevasse. If you choose to land on this pad instead of the one at ground-level you are awarded a bigger bonus. The risk is optional!

You cannot land at a speed greater than -5 or your ship disintegrates, so while aligning yourself with the base you must use your thrust to brake your descent, which uses up fuel. The contents of your fuel tank are therefore displayed all the time, as is your speed.

It seems that your arrival is not welcome and you are set upon by a series of missiles which are on course around the planet's surface. You are also bombed from above.

There are four levels of difficulty:

LANDER

A spaceship pilot works hard for a living in Jason Holiday's game.



Listing 3

```
10 IF PAGE<>D000 CLS:PRINT"PAGE SHOULD
=>D000":VDU7:END
20
30
40 REM DELETE LINES 1,2 & 3 IF A TAPE
SYSTEM IS IN USE ie PAGE<>E000
50 REM*****
60 REM* Lander *
70 REM*
80 REM* J. Holiday *
90 REM*
100 REM* (c)1984 Hollisoft *
110 REM*****
120
130 DIM SC(15),NAME$(15)
140 FOR T=1 TO 15:NAME$(T)="Hollisoft":NEXT
T
150*FX200,1
160 ON ERROR PROCERR
170 HI%=0
180 REPEAT
190 MODE7
200 PROCINSTRUCT
210 PROCINIT
220 RESTORE
230 MODE2
240 VDU19,13,1;0;0;0;
250 VDU19,8,5;0;
260 VDU19,9,4;0;
270 VDU19,12,1;0;
280 VDU19,15,2;0;
290 PROCDRAWSCREEN
300 PROCSCORE
310 PROCCHIP
320 REPEAT
330 VDU5
340 PROCCHIP
350 PROCALC
360 FUEL%=FUEL%-1:PROCFUEL
370 PROCSPEED
380 PROCNOFF
390 IF FUEL%<200 FUEL%=199
400 UNTIL DEAD
410 IF EX PROCEXPLODE
420 PROCISCORE
430 UNTIL FALC
440 DEFPROCALC
450 IF JOY%<FUEL%:PROCMOVE:ELSE PROCJOY
460 IF Y%>600:METX%:=METX%-(LEV%+32):IF MET
X%<0:PROCCCHANGE ELSE IF Y%>600:PROCMETEOR:
ENDPROC
470 IF Y%<600:PROCDOWN:bomy%:=bomy%-32
480 IF bomy%<64:PROCCCHANGE2
490 ENDPROC
500 DEFPROCDRAWSCREEN
510 RESTORE 570
520 MOVE0,0
530 GCOL0,1
540 FORT=0 TO 12
550 READX,Y:PL0T85,X,Y
560 NEXT
570 DATA0,500,200,600,220,650,230,500,0
,0,250,300,270,250,300,240,0,0,350,200,3
```

```
00,120,0,0,100,50
580 MOVEB00,10:MOVEB00,50
590 FORT=0 TO 9
600 READX,Y:PL0T85,X,Y
610 NEXT
620 DATA600,50,500,200,650,450,800,50,8
00,500,750,610,1280,610,1280,10,800,10,8
00,610
630 GCOL0,1:MOVEB50,650:PL0T85,750,600
640 MOVE1280,16:MOVE1280,0:PL0T85,0,0:M
OVE0,16:PL0T85,1280,16
650 COLOUR129:COLOUR0:PRINTTAB(11,31)"X
10"
660 PRINTTAB(13,14)"X2"
670 PROCPADS
680 PROCfuel
690 ENDPROC
700 DEFPROCCHIP
710 GCOL2,0:MOVEX%,Y%:VDU224:IF THRUST=
TRUE MOVEX%,Y%-25:VDU18,3,13,225
720 IF Y%>1087:PROCCZAP:DEAD=TRUE:ENDPRO
C:ELSEX%:=X%+NLX%:Y%:=Y%+DLY%:DLY%=-EX%:IF X%<0
THEN X%=-0 ELSE IF X%>1100 X%=1100
730 GCOL3,4
740 MOVEX%,Y%:VDU224
750 THRUST=FALSE
760 PROCHECK
770 ENDPROC
780 DEFPROCMOVE:IF FUEL%<=200 INC=INC-1
:ENDPROC
790 IF INKEY(-98)NLX%=-DRIF%
800 IF INKEY(-90)NLX%=DRIF%
810 IF INKEY(-74) INC=INC+2:THRUST=TRUE
:FUEL%=FUEL%-4:PROCTRUST ELSE IF INC>-9
INC=INC-1:PROCTRUST
820 ENDPROC
830 DEFPROCJOY:IFFUEL%<=200 INC=INC-1:EN
DPROC
840 JOY1X=ADVAL(1):DIV256:JOY2Y=ADVAL(0)
AND3
850 IF JOY1X%>150 NLX%=-DRIF%
860 IF JOY1X%<50 NLX%=DRIF%
870 IF JOY2Y%>1 INC=INC+2:THRUST=TRUE:FUE
L%=FUEL%-4:PROCTRUST ELSE IF INC>-9 INC
=INC-1:PROCTRUST
880 ENDPROC
890 DEFPROCCHIP
900 QX%=POINT(X%,Y%-37):QY%=POINT(X%+64,
Y%-32):QZ%=POINT(X%+64,Y%-16):QR%=POINT(
X%,Y%):QT%=POINT(X%+64,Y%+8)
910 IF QX%=10RQX%=1 OR QY%=1 OR QR%=1 OR QT%=
1:DEAD=TRUE:ENDPROC
920 IF QX%=4:PROCTUNE:PROCPADS:IF DEAD=TRU
E:ENDPROC ELSE IF QX%=4:PROCScore(10):PROCS
CORE
930 IF QX%=5:PROCTUNE:PROCPADS:IF DEAD=TRU
E:ENDPROC ELSE IF QX%=5:PROCScore(2):PROCS
CORE
940 IF QX%=2 OR QY%=20R QX%=20R QR%=20R Q
TX%=2:DEAD=TRUE:ENDPROC
950 IF QY%=6 OR QX%=6 OR QY%=6 OR QW%=6 O
RQX%=6:DEAD=TRUE:ENDPROC
960 ENDPROC
```

```
970 DEFPROCTHRUST
980 IF THRUST=TRUE:GCOL3,13:MOVEX%,Y%-2
5:VDU225:SOUND0,-15,4,1
990 DX=D%+INC
1000 SPEED%=D%
1010 ENDPROC
1020 DEFPROCFCUEL:MOVE150,FUEL%:GCOL0,1:V
DU231:ENDPROC
1030 DEFPROCNOFF
1040 IF INKEY(-17) THEN*FX210,1
1050 IF INKEY(-82) THEN*FX210
1060 IF INKEY(-66) PROCPCASE
1070 ENDPROC
1080 DEFPROCUNE
1090 IF DEAD=TRUE:ENDPROC
1100 IF -SPEED%<=5:DEAD=FALSE ELSE IF -SP
EED%>5:DEAD=TRUE:ENDPROC
1110 SOUND2,0,0,0
1120 RESTORE1250
1130 FORT=1 TO 14
1140 READ note,dur%
1150 SOUND1,-15,note,dur%
1160 NEXT
1170 INC=16
1180 GCOL0,2:VDU32,227:FORT=1 TO 5000:NEXT
1190 GCOL0,0:MOVEX%,Y%:VDU226,226,226
1200 X%=64:Y%=800
1210 PROCCHANGE
1220 PROCSCORE
1230 PROCERASEBOMB
1240 ENDPROC
1250 DATA5,1,21,1,33,1,53,5,33,1,21,1,5,
1,13,2,25,2,41,2,61,10,41,2,25,2,13,2,-1
1260 DEFPROCscore(sc%)
1270 SQ%=ABS(sc%*DX%)*3:SC%=SC%+SQ%:fuel%
=200+SQ%*3
1280 GCOL0,4
1290 REPEAT:MOVE150,FUEL%:VDU231:FUEL%=F
UEL%+16:SOUND1,-10,FUEL%,2:UNTIL FUEL%>=
fuel% OR FUEL%>=532
1300 ENDPROC
1310 DEFPROCSCORE:IF SC%>HI%:HI%=SC%
1320 NLX%=0:LEV%=LEV%+4:IF LEV%>64 LEV%=64
:DRIF%=DRIF%+4:IF DRIF%>32 AND DRIF%>37
PROCBONUS:IF DRIF%>64 DRIF%=64:PROCBONUS
1330 VDU4:VDU23;8202;0;0;0;:COLOUR129:CO
LOUR4:PRINTTAB(9,23)"Score ";SC%;TAB(11,
25)"Hi ";HI%
1340 PRINTTAB(11,27)"Level ";INT(LEV%/8)
1350 PRINTTAB(11,29)"Drift ";INT(DRIF%/8)
)
1360 VDU5
1370 ENDPROC
1380 DEFPROCDEAD
1390 VDU22,7
1400 SOUND1,0,0,0:SOUND0,0,0,0
1410 SOUND2,0,0,0
1420*FX15
1430 FORT=3 TO 4:PRINTTAB(5,T)CHR$141CHR$1
32CHR$136"!!**D E A ****!"
1440 NEXT
1450 FORT=8 TO 9:PRINTTAB(2,T)CHR$141CHR$1
33"You scored";CHR$136;SC%;NEXT
```

Listing 1

```
80 VDU23,224,24,102,129,255,66,60,66,1
29
90 VDU23,225,60,60,24,20,32,0,0,0
100 VDU23,226,255,255,255,255,255,2
55,255
110 VDU23,227,56,186,146,254,56,56,68,6
8
120 VDU23,228,0,62,127,255,255,127,62,0
130 VDU23,229,7,24,236,247,235,234,24,7
140 VDU23,230,99,119,127,62,62,62,28,8
150 VDU23,231,60,60,60,60,60,60,60,60
160 VDU23,232,129,129,129,129,129,129,1
29,129
170 MODE7
180 FORT=1 TO 10
190 PRINTTAB(3,2)CHR$141CHR$132CHR$157C
HR$133"LANDER "CHR$157CHR$132"LANDER "
CHR$157CHR$133"LANDER "CHR$156
200 PRINTTAB(3,3)CHR$141CHR$133CHR$157C
HR$132"LANDER "CHR$157CHR$133"LANDER "
CHR$157CHR$132"LANDER "CHR$156
210 FORT=1 TO 100:NEXT
220 PRINTTAB(3,2)CHR$141CHR$133CHR$157C
HR$132"LANDER "CHR$157CHR$133"LANDER "
CHR$157CHR$132"LANDER "CHR$156
230 PRINTTAB(3,3)CHR$141CHR$132CHR$157C
HR$133"LANDER "CHR$157CHR$132"LANDER "
CHR$157CHR$133"LANDER "CHR$156
240 SOUND1,-(T+5),1,1
250 NEXT
260 FORT=1 TO 4:PRINT"CHR$154CHR$(146+T)T
AB(5)"k k 7k k k 7k 7" k7"
270 PRINTCHR$154CHR$(146+T)TAB(5)"j,n 5
j j j 5 -1 5j =# 5j"
280 PRINTCHR$154CHR$(146+T)TAB(5)"z z u
z jppjpp zu pz uz 5 j5"
290 NEXT
300 VDU28,7,24,32,22
310 CLS:PRINTCHR$136CHR$129" LANDER IS
LOADING"
320 PRINTTAB(5)CHR$132CHR$136:CHAIN"La
nder2"
>
```

```
1460 FORT=1 TO 12:PRINTTAB(1,T)CHR$141CHR
$135"Hi-score";CHR$136;HI%:NEXT
1470 FORT=14 TO 15:PRINTTAB(2,T)CHR$141CHR
$133"On Level";CHR$136;INT(LEV%/8):NEXT
1480 FORT=17 TO 18:PRINTTAB(1,T)CHR$141CHR
$132"With a drift of";CHR$136;INT(DRIF%/
8):NEXT
1490 PRINTTAB(8,20)CHR$141CHR$134"Anothe
r go?"
1500 PRINTTAB(8,21)CHR$141CHR$135"Anothe
r go?"
1510 A%=GET$:IFA%="Y" ENDPROC ELSEIFA%="N"
PROCKILL ELSEGOTO1490
1520 ENDPROC
1530 DEFPROCINSTRUCT
1540 FORT=1 TO 2
1550 PRINTTAB(4,T)CHR$141CHR$129"Level
(1 Easy - 4 hard)":NEXT
1560 LEV%=GET%-48:IF LEV%<10:LEV%>40:TO 155
0:ELSE LEV%=LEV%*8
1570 PRINTTAB(10,4)LEV%/8
1580 FORT=6 TO 7
1590 PRINTTAB(0,T)CHR$141CHR$141"Rate of drift(
Low Drift-High drift)":NEXT
1600 DRIF%=GET%-48:IF DRIF%<10:DRIF%>80:TO
1590 ELSE DRIF%=INT(DRIF%/8)
1610 PRINTTAB(10,8)DRIF%/8
1620 PRINT"CHR$129CHR$157CHR$135"PRESS
<Space Bar> OR (Fire) TO START";
1630 PROCKEYORJOY
1640 EX=16
1650 ENDPROC
1660 DEFPROCMETEOR
1670 IF bomy%<100 AND X%>400:PROCCERASEB
OMB
1680 GCOL0,2
1690 MOVEmetX%,metY%:VDU228,229:GCOL0,0:
MOVEmetX%+128,metY%:VDU226,226
1700 ENDPROC
1710 DEFPROCCHANGE
1720 IF DEAD=TRUE:ENDPROC
1730 MOVEmetX%,metY%:GCOL0,0:VDU226,226,
226,226
1740 metX%=1100:metY%=RND(300)+700
1750 ENDPROC
1760 DEFPROCDOWN
1770 IF bomy%>950:PROCCIRASE
1780 MOVEbomX%,bomY%:GCOL0,6:VDU230:GCOL
0,0:MOVEbomX%,bomY%+32:VDU226
1790 ENDPROC
1800 DEFPROCCHANGE2
1810 GCOL0,0:MOVEbomX%,bomY%+32:VDU226
1820 bomX%=RND(100)+325:bomY%=1000:ENDPR
OC
1830 DEFPROCIRASE
1840 MOVEmetX%,metY%:GCOL0,0:VDU226,226,
226
1850 ENDPROC
1860 DEFPROCEXPLODE
1870 SOUND2,0,0,0
1880 FORT=-15 TO 1
1890 GCOL3,RND(16)
1900 MOVEX%+32,Y%-16:MOVEX%+RND(100),Y%
```

Level 1 is relatively easy with less bombs and missiles than level 4. There are eight drift speeds (the speed at which you advance, and as you complete each stage you automatically move up a level till you reach the most difficult level.

Listing 2

```
80
90 PRINT"Do you want""Instructions"
100 A%=GET$:IFA%<>"Y"AND A%<>"N"AND A%<>"
n"AND A%<>"N" THEN RUN
110 IFA%="Y"OR A%="Y" THEN PROCINSTRUCTIO
ONS
120 CHAIN"Lander3"
130
140 DEFPROCINSTRUCTIONS
150 VDU22,7:PRINT"TAB(9)CHR$141CHR$129
CHR$157CHR$134" MOWER "CHR$156:PRIN
TTAB(9)CHR$141CHR$129CHR$157CHR$134" MO
WER "CHR$156
160 FORT=7 TO 8:PRINTTAB(9,T)CHR$141CHR$1
J HOLLIDAY."NEXT
170 FORT=11 TO 12:PRINTTAB(4,T)CHR$141CHR$1
R HOLLISOF PUBLICATIONS":NEXT
180 PRINTTAB(0,23)CHR$129CHR$157CHR$135
CHR$136" PRESS <SPACE BAR> TO CONTINUE
"
190 PROCSPACE
200 VDU22,7
210 CLS:FORT=2 TO 3:PRINTTAB(7,T)CHR$129C
HR$157CHR$141CHR$131" INSTRUCTIONS "
CHR$156:NEXT
220 CLS:PRINTTAB(7,2)CHR$141CHR$129CHR$
157CHR$135"* * L A N D E R * *"CHR$15
6
230 PRINTTAB(7,3)CHR$141CHR$135CHR$157C
HR$129"* * L A N D E R * *"CHR$156
240 PRINTTAB(2,5)"You are the pilot of
a shuttle craft from the 'Enterprise'."
250 PRINTTAB(1,7)"Your task is to land
```

Successful landings could result in your name being entered in the 15-name long hiscore table.

Enter the program in order in three parts (Lander 1-3), saving the program at each stage.

```
on a unknown planet so some scienti
sts can examine some rocks."
260 PRINTTAB(10,11)CHR$141CHR$129"BEWAR
E"
270 PRINTTAB(10,12)CHR$141CHR$135"BEWAR
E"
280 PRINTTAB(1,14)"Enemy missiles patr
ol the planet and bombs drop from the s
ky""You also have to land with a speed
greater than -5"
290 PRINTTAB(1,19)"There are 8 difficul
ty levels and 8 different speeds.Your
speed and"
300 PRINT"difficulty levels automatical
ly increase when you land."
310 PRINTTAB(4,24)CHR$129CHR$136"Press
<SPACE BAR> to continue"
320 REPEAT UNTIL GET$=" "
330 CLS:PRINTTAB(10,3)CHR$141CHR$129CHR
$157CHR$135"KEYS "CHR$156
340 PRINTTAB(10,4)CHR$141CHR$135CHR$157
CHR$129"KEYS "CHR$156
350 PRINT"CHR$129"Z ..... Left"
360 PRINT"CHR$130>Delete ... Right"
370 PRINT"CHR$131"Return ... Thrust"
380 PRINT"CHR$132"Q ..... Sound of f"
390 PRINT"CHR$133"S ..... Sound on"
400 VDU28,22,15,39,13
410 ENDPROC
420
430 DEFPROCSPACE:REPEAT UNTIL GET$=32:EN
DPROC
>
```

```
+RND(100)
1910 PLOT85,X%+RND(800)-400,Y%+RND(800)-
400:SOUND0,T,6,5:NEXT
1920 FORT=1 TO 5000:NEXT:ENDPROC
1930 DEFPROCERASEBOMB:GCOL0,0:MOVEbomX%,
bomY%+32:VDU226
1940 bomY%=1000
1950 ENDPROC
1960 DEFPROCBOBONUS
1970 VDU4:COLOUR13:COLOUR128:PRINTTAB(0,
6)"!! B O N U S !! "
1980 RESTORE2010
1990 FORT=1 TO 6:READA,B:SOUND1,-15,A,B:S0
UND2,-10,A,B
2000 NEXT
2010 DATA5,5,53,5,101,5,149,5,197,5,245,
5
2020 FORT=1 TO 1000:NEXT
2030 PRINTTAB(0,6)"
:VDU5
2040 SC%=SC%+50:ENDPROC
2050 DEFPROCSPED:VDU4:PRINTTAB(9,21)"Th
rust =";SPEED%:"":VDU5:ENDPROC
2060 DEFPROCPCADS
2070 MOVE250,16:MOVE250,0:GCOL0,4:PL0T85
,500,0:MOVE250,16:PL0T85,500,16
2080 GCOL0,5:MOVEB00,610:MOVEB00,580:PL0
T85,1000,580:MOVE1000,610:PL0T85,800,610
2090 ENDPROC
2100 DEFPROCZAP
2110 VDU22,2
2120 EX=FALSE
2130 VDU5
2140 FORT=1 TO 15:MOVERND(1280),RND(1023):
PLOT85,RND(1280),RND(1023):COLOURRND(16)
:GCOL3,RND(16)
2150 SOUND0,-15,RND(3)+4,3:SOUND1,-10,RN
D(50),3:PRINTTAB(RND(19),RND(23))"*":NE
XT
2160 VDU4:COLOUR15
2170 VDU28,0,16,18,15:VDU4:COLOUR5:PRINT
"YOU WENT TOO HIGH!!"
2180 FORT=1 TO 2000:NEXT
2190 ENDPROC
2200 DEFPROCKEYORJOY
2210 REPEAT
2220 A%=INKEY(0)
2230 UNTIL A%<32 OR A%<69 OR ADVAL(0)AND
3
2240 IFA%<32 JOY%<FUEL%:ENDPROC
2250 IFA%<69 PROCKILL
2260 JOY%<FUEL%
2270 ENDPROC
2280 DEFPROCPCASE
2290*FX21,0
2300 REPEAT
2310 A%=GET
2320 UNTIL A%<65
2330 ENDPROC
2340 DEFPROCINIT
2350 VDU23;8202;0;0;0;:X%=64:Y%=800:metX
%=1100:metY%=800:bomX%=375:bomY%=1000
```

```
2360 NLX%=0:SC%=0:INC=16:SPEED%=0
2370 THRUST=FALSE:DEAD=FALSE:EX=TRUE
2380 FUEL%=532
2390 ENDPROC
2400 DEFPROCERR:VDU22,7,7:PRINT"REPORT
:PRINTCHR$135CHR$137"at line"CHR$136CHR$
130:ERL:END
2410 DEFPROCISCORE
2420 IF SC%<=SC(10) PROCDEAD:ENDPROC
2430*FX21
2440 VDU22,7:RESTORE2610:FORT=1 TO 4:READA
,B,C,D:SOUND1,-15,A,B*10:SOUND2,-10,C,D*
10:NEXT
2450 FORT=7 TO 8:PRINTTAB(5,T)CHR$141CHR$1
29CHR$157CHR$130"YOU HAVE A HIGH SCORE
":CHR$156:NEXT
2460*FX21,0
2470 PRINTTAB(9,11)CHR$129CHR$157CHR$131
"CHR$156
2480 PRINT"TAB(6)"PLEASE ENTER YOUR NA
ME":TAB(12,11)
2490 REPEAT
2500 A%=GET$:Q%=Q%+A%:PRINTA%:UNTILLEN(
Q%)>14 OR A%=CHR$13:IF LEN(Q%)>14 VDU7,12
7
2510 NL=0:REPEAT:N=N+1:UNTIL SC(N)<SC% ORN
=10
2520 IF SC(15)<SC% NN=16:REPEAT NN=NN-1:S
C(NN)=SC(NN-1):NAME$(NN)=NAME$(NN-1):UNT
IL NN=N:SC(N)=SC%:NAME$(N)=Q%
2530 CLS:FORT=0 TO 1:PRINTTAB(5,T)CHR$141C
HR$129CHR$157CHR$130"LANDER HALL OF FAM
E "CHR$156:NEXT
2540 PRINT
2550 FORT=1 TO 15:PRINT;P;TAB(4);"":SC(P
);TAB(12);"....":TAB(19);NAME$(P):NEXT
2560 Q%=""
2570 PRINT"CHR$135CHR$136CHR$157CHR$132"
PRESS <Space> OR (Fire) TO START"
2580 PRINTCHR$135CHR$136CHR$157CHR$132"
"E"TO END"
2590 PROCKEYORJOY
2600 ENDPROC
2610 DATA101,1,117,1,89,1,101,1,101,1,11
7,1,117,1,137,1
2620 DEFPROCCKILL
2630*FX21
2640 KEY1=0
2650 CALL &FFFC
2660 ENDPROC
2670 DEFPROCfuel
2680 VDU5
2690 GCOL0,0
2700 FORT=200 TO 500:STEP32:MOVE150,T:VDU23
2
2710 NEXT
2720 GCOL0,4
2730 FORT=200 TO 500:STEP32:MOVE150,T:VDU23
1
2740 NEXT
2750 ENDPROC
```


CANON'S SHOT AT MSX

The advent of yet another MSX machine is no longer big news. But how does Canon's venture into this area of the market measure up? Is MSX the answer to the computer industry's dreams? Kenn Garroch investigates.



The V-20 keyboard layout conforms to the MSX standard.

The MSX revolution is trying hard to happen. This version from Canon is another of the surprisingly old-fashioned (new) machines.

First impressions

The first thing that strikes you about the Canon V-20 is, naturally enough, its close resemblance to the other MSX machines. It sports a similar keyboard, an identical Basic, the same interfaces, and the same good old Japanese engineering inside and out.

For £280 you get the Canon itself with internal power supply, a cassette lead with motor control, an aerial lead, and two manuals. It's all packed into a cardboard box just the right size for you to carry it easily out of the shop — more good Japanese engineering.

All that remains to be done is attach a mains plug, plug into the TV and mains, and off you go.

In use

Switch on and the Canon sits and thinks for three seconds or so as if in shock. Then up comes a message that this is MSX Basic and there are just over 28K bytes free. For a machine that is

supposed to have 64K of RAM, this is a little meagre.

On perusing the memory maps in the manual, I discovered that 32K of the RAM is not in fact available to Basic. Curiouser and curiouser. This memory is hidden beneath the Basic ROM, and appears to be used for the video RAM. Part of this is used to store the sprite data and with a maximum of 256 8×8 sprites, this comes to 2K. The rest must be used for the video display itself, although from the resolutions available, there must be quite a lot spare. The Spectrum fits a 256×192 plus eight colours and three attributes into 7K of RAM. The V-20 and presumably all other MSX machines have 256×192 with 15 colours and one attribute.

What, we ask ourselves, happened to the other 23K of video RAM? Perhaps it will be used at a later date, running the mythical CP/M system, to give an 80-column screen and higher density graphics, although why they didn't do this as standard beats me.

The V-20 keyboard is of the standard defined by Microsoft, ie the same layout as the rest. The resemblance ends here as the function keys are larger and rattle

more. I also think they are relatively poorly positioned, though they do come preprogrammed with a selection of useful functions such as RUN and LIST. They can, of course, be reprogrammed using the key command but accept only 16 bytes of data.

The other eight large keys are split into two groups. Four are used as cursor control keys allowing full on-screen editing as with the Commodore 64. Again, these are too large to be comfortable. The other four are the stop key, insert, delete, and home/cls. The stop key, when pressed, only pauses the



program; control stop actually breaks you out of Basic.

On the rear are the connections for the cassette, audio, video and RF outputs, and the printer port. The latter uses a bizarre plug that is apparently a 14-way Amphenol. This could cause some people problems with interfacing to printers but presumably, if MSX takes off to any extent, they will become more common.

On the front are the two joystick ports. These are the standard Atari/Commodore connections.

The cartridge slots are on the top and the side. The V-20 differs from some of the other machines in this respect as both these slots are cartridge connectors and not edge connectors. This is handy as the peripherals are designed to connect into the cartridge slot and this system should allow you to have both a cartridge and a peripheral connected at the same time without needing a special connector for one or the other.

In general, the machine is solidly built, although it would have been nice to be able to detach the power cable in transit.

The Basic

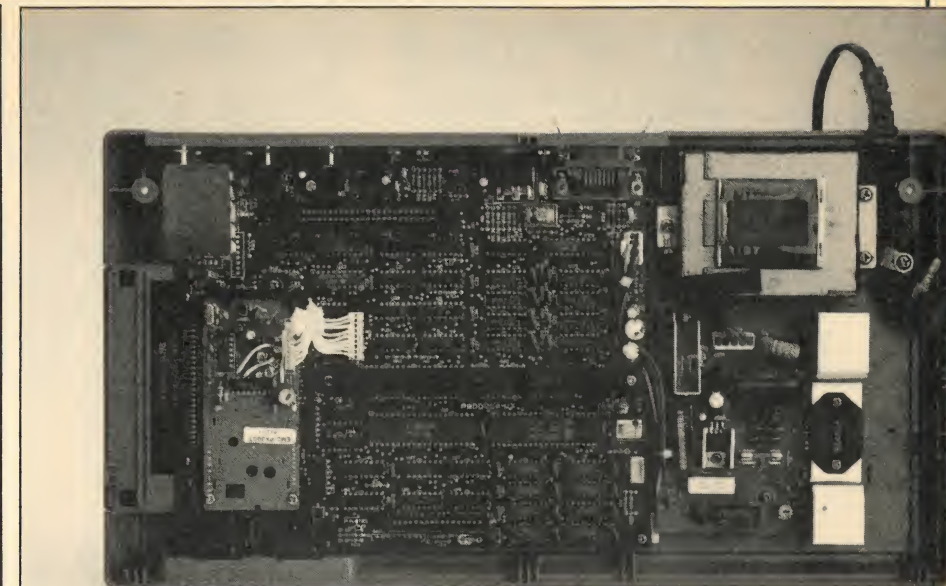
Most MSX machine reviews have covered the hardware in detail, so let's take a closer look at the Basic.

As its name implies, this is based on the good old standard as used by Dragon, Commodore, IBM, and CP/M MBasic. The extensions are a whole host of additional commands to allow control over the fancy bits of hardware, such as the sprite and screen controllers plus a few commands that appear to have been added because it seemed like a good idea at the time.

Altogether 150 commands and functions are available, covering everything from Binary, Hex, and Octal conversions to error handling, sprite, and I/O controls. Unfortunately, this vast array of commands is poorly documented in the Basic reference manual. One particular moan here is lack of details on the sprite handling. Simple things such as how to define them are demonstrated in the explanation of the DATA statement which means that you are sent rooting about all over the manual before you get anything done.

Overall, these extra commands appear to be handy and innovative — particularly the interrupt facilities which were previously available only on the Amstrad. The trouble is, they are not implemented nearly as well as the Amstrad, though interrupts can be made to occur on a number of different events such as sprite collision, the joystick fire button being pressed, the timer hitting zero, or a function key being pressed. The commands for controlling them are ON event GOSUB line No., where an event can be any one of the above, and event can be ON/OFF or STOP.

When the event occurs, the program



The machine is made from readily available components.

jumps to the subroutine and begins executing it. When it finishes, the main program resumes from where it left off. The only thing to watch is that variable names do not become confused.

The problem with the interrupts is things are not as simple as initially appears. For instance, if you set up an interrupt to occur when a function key is pressed, holding the key down gives repeated interrupts. If, however, you then press another function key, the repeat stops working. This is downright annoying if it is one of the movement controls in a game. I suspect that this is a bug (oh, dreaded word) that will be corrected in a later version.

The question here is why not allow an interrupt for any key on the keyboard instead of one of the ten function keys, five of which need the shift key to access them and all of which are badly placed for game controls?

Still on the subject of the interrupts, when two sprites collide, an interrupt occurs. This sounds great until you realise that the machine will not automatically tell you which sprites collided. You must work it out for yourself. What this boils down to is that if there are more than about four sprites on the screen at once, it's faster to detect collisions by keeping track of them in the program than use the interrupt, since you're going to have to do it anyway.

On the whole, these interrupts are a marvellous idea. It's just unfortunate that they are not better implemented.

One of the better features of the V-20 (or any MSX) is its sprite handling capabilities from Basic.

Sprites are constructed from a series of character code numbers stored in the psuedo array SPRITE\$. The numbers themselves are stored in part of the unused section of the video RAM. They can be in either of four sizes depending

on the SCREEN mode selected, 8×8 or 16×16, normal or double size (enlarged). Since a limited amount of storage space is available, you get 256 in 8×8 and (obviously) 64 in 16×16 mode. Once defined, it is possible to select any 32 to be on the screen at once. This is a handy way of doing things as it allows easy animation effects to be created.

Unfortunately, there can be only four sprites on any horizontal line at once. If an extra one is put there, it rubs out the right-most one. This causes a problem when writing a space invaders-type game as only the launcher and the rocket can be sprites otherwise there are only three invaders per line which looks pretty silly.

Defining the sprites is simply a matter of setting up eight DATA statements, each with an 8-bit binary number in it, using the BIN commands. A short routine reads these, converts them into decimal and puts the CHR\$(n) numbers into a string array. The resulting eight character string is then placed into SPRITE\$(n) where n is the sprite to be defined. Placing the sprite on the screen is fairly straightforward, using the PUT SPRITE command, specifying the sprite number, whether the next position is relative or absolute, position, colour, and sprite image to use number. Obviously this sequence shows that the sprite handling is flexible.

The only real problem is in changing screen modes, as this deletes all previously stored sprite information. You can't have everything, it seems.

Where the MSX machines do score is in their wealth of high-resolution graphics commands including CIRCLE, PAINT and a neat line command. This allows either point-to-point lines, relative to the last position or using absolute screen coordinates. An additional feature is obtained by using the B or BF

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suffixes. The first draws an outline box, the second does the same but fills it in *ie* an implied PAINT command.

Even better is the DRAW command which allows drawing macros. This function allows a selection of commands to be placed within a string, such as U for up, D for down, rotate (A), scale (S) and colour (C). This gives you a simple turtle graphics system. Once the string is set up it is executed with DRAW string.

The screen size is a nice large, logical -32768 to 32767 of which points 0 to 191, vertically, and 0 to 255 horizontally, actually appear on the screen. So, points can be plotted off the screen without errors occurring (unless the logical limit is exceeded).

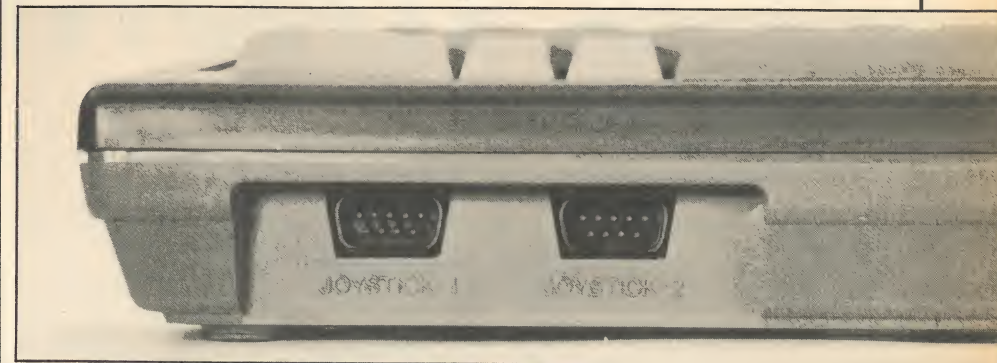
A total 15 colours are available plus a transparent option. These are obtained mainly with the COLOR command although what colours are available depends on the screen mode you're in. There are four of these, the first giving 40×24 characters, no graphics or sprites, no border, and only one colour. The second is the default, *ie* boot-up screen giving 32×24 characters with every eight pixels having their own colour, sprites are also allowed but no graphics.

The next mode allows graphics but no

macro facility again comes into its own with PLAY. This resembles the DRAW macros but instead of movement commands, you have the notes ABCDEFGA and the £ character for sharps. Once a tune is set up, the speed, volume and waveform shape can be changed. The sound normally comes from the TV speaker, but if you use a monitor, there is

a clue to some of its possibilities.

The standard access commands are there including FORMAT (none of those tricks that Acorn plays), DEL, COPY, and DIR. With the MSX DOS system disk you will get a separate disk Basic giving far more flexible filing with random access and field control. The DOS appears to be quite similar to the Basic A system on



The joystick ports are at the front of the machine, giving easy access.

a direct sound output socket.

MSX machines will, in future, allow an upgrade from cassette systems to disk and possible CP/M. The file handling is standard Basic for the cassette system. There are two save and load commands. CSAVE saves files in internal, tokenised format and SAVE does the same in ASCII

machines but details in this section give the IBM, and it remains to be seen whether the commands given in the Canon manual are the real thing or not.

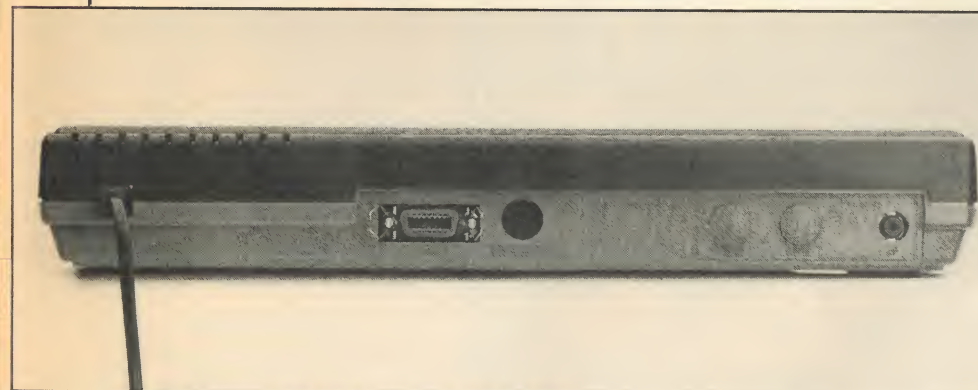
While the Basic is a flexible programming tool, one or two drawbacks make it tricky. The lack of a good manual contributes to this, but it's likely that any number of helpful books will soon appear.

Another problem is execution speed. It's slow compared with other machines that offer even more facilities. The interrupts should get round this speed problem a little, but as they have not been that well thought out, they are more trouble than it's worth.

Verdict

The Canon V-20 doesn't stand out in the MSX crowd. It just conforms to the standard in most senses. Initially, the Basic appears excellent, but closer acquaintance and poring over the manuals took off some of its lustre.

If the Japanese push hard enough, they may snaffle part of the British market. However, if this is their best home micro, Sinclair, Commodore and Acorn, to name but a few, are still winning hands down.



Most of the connections are at the rear of the machine.

text and again only every eighth pixel may have its own colour. This mode gives the highest 255×192 resolution. For graphics where each pixel has its own colour, SCREEN 3 is used. Unfortunately, this only gives a medium resolution of 64×48.

Also defined by the SCREEN command are the sprite size, the key click (on/off), the tape speed, 1200/2400 baud, and printer type. The last specifies whether the printer can produce the MSX character set. If it can't, the printer produces spaces.

As for getting into the insides, MSX Basic is well-equipped. PEEK, POKE, and USR are available as well as INP, OUT, TIME and WAIT. Access to the video RAM is via the VDP command which allows you to go straight into the controller registers. VPEEK and VPOKE are also there giving even more direct access.

Easy sound output is via the BEEP command. More complex features are available with SOUND giving access to the programmable sound generator. The

format. BLOAD and BSAVE allow sections of memory to be directly saved — all pretty standard stuff.

At the back of the MSX Basic reference manual is a brief summary of MSX DOS commands. No disk systems are currently available for MSX

SPECIFICATIONS

System	Canon V-20 MSX
Price	£280
Processor	Z80A running at 3.58MHz
ROM	32K
RAM	64K, only 28K for Basic
Screen	40×25 characters Mode 0, 32×24 Mode 1
Sprites	8×8 or 16×16 normal or enlarged
Graphics	256×192 Mode 2 64×48 Mode 3
Colours	15 plus transparent, less depending on screen mode
Keyboard	74 keys including ten function keys
Interfaces	Two cartridge ports, cassette port, two joystick ports, centronics printer, audio output, video output, RF output
Operating system	MSX Basic
Software included	None
Distributor	Most high street stores



SPINNING A WACKY WEB

Tired of trudging through damp caves and endless forests? Do you find it difficult to stifle a jaw-cracking yawn as you bash your umpteenth Orc? Are you just that teensiest bit jaded with the same old stock characters and situations being trotted out in adventures?

Well, just hurry on down to your nearest software store and take a long hard look up at the shelves: see the garish masked figure on the package? Is it a bird? Is it a plane? Is it some twit who's got lost on his way to a fancy dress ball? That last guess was nearly right, for that lithe slab of muscle in the gorbimey garb is none other than Marvel Comics Super-hero, Spider-Man, taking the starring role in Adventure International's follow up to the successful *Hulk* adventure, being the second by Scott Adams in the Questprobe series. As with *Hulk*, *Spider-Man* combines text with attractive and instantaneous hi-res graphics of every location.

Spidey delivers a swift slice of knuckle pie to any idea you might have about meeting the standard set to wizards, goblins, and other overfamiliar foes. The wackiness of the adversaries in this adventure make your average troll seem as normal as Julie Andrews.

Sandbagged

Take Sandman for instance—a neat variation on those old Charles Atlas ads if ever I saw one. Sandman has the mildly disconcerting property of being able to transform himself from a small portion of beach into a sandstone strongman. And there's more where those weirdos came from. Hydro-Man is a big drip—literally: he's made of water. Electro is not the best of people to greet with a handshake, as his body contains 100,000 volts of grade A electricity.

Ringmaster looks and acts like he's just escaped from the big top and now craves a bit of privacy—he throws you out of his computer lab every time you enter. The Lizard is Doc Connors in one of his reptilian moods.

The amazing Spider-Man, like his comic strip colleague the Hulk, has entered the realm of advantage games. Bob Chappell marvels at Spidey's progress.



You are not completely without friends. Madame Web, though blind, is able to scan other people's thoughts and can sometimes predict the future. The Chief Examiner (remember him from *Hulk*? All the evidence points to the conclusion that the CE is none other than Scott Adams himself) may offer advice and a way of escape.

The basic plot is pretty much the same as in *Hulk*: find and store all the gems. Since you can bet your suction-padded boots that some of the jewels are being protected by the oddballs above, the job is not going to be easy.

Doubletake

I began in a hall, way up in a high-rise building. Thinking to explore some of the other floors,

I made my way to the very obvious lift and pressed the even more obvious call button. You're right, that *was* too obvious. Think again, Spidey. At one point in my perambulations, I began to think that either my computer had gone on the blink or I was suffering from double vision.

Turned out that I had encountered another fiendish foe, Mysterio. His speciality is hypnotism and special effects. Good job I didn't ring the TV repair man or optician.

It helps if you have read the comic that comes with the game, especially the potted biographies of the characters. The puzzles range on a scale from candy-from-a-baby to hurl-micro-through-window. The packaging describes the

difficulty level as moderate—a fair assessment. I foolishly believed I was doing brilliantly by finding eight of the gems (you shouldn't have too much hardship in finding where to store them), but my score showed that I still had a long way to go.

There is a much improved command analyser, allowing you to move away from the normal verb/noun input. Now you can enter compound orders and use a more English-like structure. I still found myself using two-word input (old habits die hard), but I particularly liked being able to 'TAKE ALL' objects in a room, instead of picking them up (or dropping them) one by one. Response to your input is, as ever, immediate.

Spider-Man is good, zany fun and provides as wild a collection of characters as you could wish to meet, together with the usual teasing puzzles of Scott Adams, and walking on the ceiling certainly makes a change from battling with dragons.

Cloak doom

I do declare, an adventure for the Atari and a welcome rarity it is too. *Cloak of Death* (by Mind Games) is a text and graphics romp through a haunted house where you've wagered to spend the night. I haven't made much progress yet, but what I've seen I've liked.

The game has a comprehensive vocabulary (67 verbs and 94 nouns), decent graphics for each location (you can turn them off), and a reasonable assortment of puzzles. It also displays a dry sense of humour (when I typed 'SCORE', I was told to give myself ten out of ten if I got out alive).

An enjoyable adventure—versions are also available for the Spectrum and Commodore 64.

Dungeonade

Returning to Questprobe, some *Hulk* fans cannot find anything in the dome by the small holes. Just DAMT EG. If ants are your problem, why not SEYE ESOL C. (Dungeon Master at your service.)

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CPU: 6502C microprocessor - 0.50 microsecond cycle and a clock speed of 1.79 MHz.
EXTENDED GRAPHICS FUNCTIONS: High resolution graphics. Multi-coloured character set. Software screen switching. Multiple predefined character sets. Player missile (sprite) graphics. Fine screen scrolling. Changeable colour registers. Smooth character movement. Simple colour animation facilities.
PROGRAMMING FEATURES: Built in Atari Basic programming language supporting peek, poke and USR plus at least 8 other languages available. The help key will provide additional information and menu screens with certain software. Full on-screen editing is available as well as syntax checking on entry.
INPUT/OUTPUT: External processor bus for expansion with memory and peripherals. Composite video monitor output. Peripheral port for direct connection to Atari standard peripherals. Software cartridge slot is included as well as 2 joystick controller ports.
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PERIPHERALS PRO-TEST: SPECTRUM

TUNE IN TO TTX

The world of teletext has been reserved for BBC users — that is until this OEL adaptor for the Spectrum arrived, says Ian Scales.

The company which brought Spectrum users the VTX 5000 Prestel adaptor has just released the TTX 2000 Teletext adaptor, also for the Spectrum. OEL's newest little gizmo allows Spectrum users to join the wonderful world of telesoftware and instant information, a place in the sun so far reserved for those with BBC micros and teletext TVs.

Teletext is the technology behind the Ceefax and Oracle services provided by the BBC and ITV respectively. You've probably already seen 'teaser' teletext pages going through a few predetermined accesses. You may even have seen a TV set with a teletext adaptor which enables teletext signals to be decoded and displayed at will. (See the box for more on teletext).

The TTX 2000 is supposed to sit under the Spectrum. Connection is simple — the TV aerial goes into the teletext unit and the results are output from the Spectrum in the conventional way. The 2000 attaches via a ribbon cable from the edge connector and the cable has a male appendage for the further connection of printers and other peripherals.



Sporting results can be easily checked.

The unit has its own 18-volt adaptor which, unfortunately, has the same business end as the Spectrum power jack. A few fried Spectrums could be in the offing. Another minor quibble is the documentation. Teletext may be simple, but seven pages of meagre instruction is a little tight-fisted.

In use

Setting up is simplicity itself. Just tune in the decoder to the four channels and



The TTX2000 in all its glory. Tuning knobs, aerial socket and power supply are at the back.

settle down to use it. No need for passwords, baud rates, user ID numbers etc.

The only problem is getting the

Teletext technology

Being digital, teletext seems an ideal technology for computer enthusiasts to hook into. But micro users in 1985 need to answer certain questions. Does teletext shape up as a useful service? Would a VTX 5000 or a multi-purpose hardware modem be a better investment? Indeed, is it worth worrying about communications at all? The answer to the last question is probably 'yes', but the first? . . . well, I'm not sure.

Unlike a service such as Prestel, teletext is non-interactive. You are a passive receiver of information so while you can be selective about the limited information available, you can't send information back to the service.

Teletext is broadcast on what is most easily described as spare bits of the bandwaves reserved for television transmission. Unlike TV it's not sent as an analog picture scan, but as digital information. The data is intercepted and decoded by the adaptor and the resulting text is modulated into videotext and put up on the TV screen.

The teletext service broadcasts its information as a series of pages in a loop. Page 300, say, is followed by page 100 then 102 then 103 right on through to page 300 again. The key is speed. Several pages are broadcast every second and all the user has to do is select a page number. The system waits till that page arrives, decodes it and sticks it on the screen.

When the information has been perused by the user, he selects another page number and the process repeats itself. Obviously, the more pages on the system, the greater the average waiting time between pages.

This limitation is evident on Ceefax and Oracle, especially once you've used a service like Prestel. So the big limitation is the lack of information bulk, and the lack of interaction — you can't talk back.

reception just right. Teletext is pedantic about perfect reception and you may find you get either a full page of information or nothing. Be prepared to mount an external TV aerial if you don't already have one.

There are only eight commands to remember plus few ENTERS where needed. Accessing a page involves pressing 'P' followed by a three-figure number — the pages start at 100 (depending on which system you use) and seem to go up to about 900 or so. You can change channels with a single command, save displays to Microdrive or send them to the ZX printer.

Teletext also has a 'wheels within wheels' function where information at a particular page number is rotated on each cycle, so by the time you've finished reading one page the next arrives. You suppress this feature with a Hold command.

R reveals a concealed line (where the page is concerned with a quiz for instance). You can also exit to Basic and use the Spectrum normally.

Nothing in computing is as simple to use as Teletext.

Its second big plus is that it doesn't cost you anything. Once you've bought the adaptor there are no uptime or user fees or telephone charges to feel guilty about.

Verdict

The prospect of access to Ceefax and Oracle via your computer is attractive, but there are some drawbacks. For instance, a limited amount of information is available, and it takes some time to access it.

If you can't afford Prestel but would like to take part in the information revolution, however, the TTX2000, even considering the limited amounts of information available may still be for you.

REPORT CARD: 1 TO 5

Features	●●●
Documentation	●●●
Performance	●●●
Overall value	●●●

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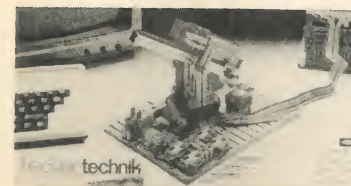
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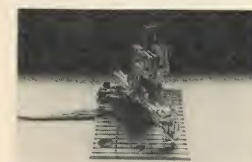
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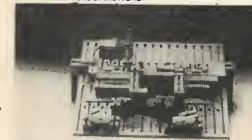
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PERIPHERALS: BBC

ROMS AWAY

Simon Williams looks at two ROMs for the Beeb that get over the problem of accessibility.

Until recently, if you wanted to plug more than three extra ROMs into your BBC micro you had to buy a ROM expansion board. The trouble with these is that you usually have to wield a screwdriver and take the top off to get at the ROMs.

Systems from Viglen and Micro Pulse get around the problem of accessibility and have the added advantage that they draw no extra power from the computer's supply.

Setting up

In the Viglen system the extra ROMs are contained in cartridges, which are plugged into a socket attached to the BBC in the hole next to the keyboard. This hole, popularly known as the 'ashtray', was left by Acorn to house the ROM cartridges for its speech synthesis system.

The socket is connected to the BBC by a ribbon cable to one of the sideways ROM sockets on the Beeb's main board. Your expansion ROMs fit into carriers that plug into the ashtray socket.

The system comes in kit form consisting of socket with 28-way ribbon cable attached; one cartridge; cover for the socket; cover for the ROM carrier when not in use; and blanking plate to restore the Beeb if you want to take the system out.

The cartridge has two plastic mouldings which screw together to sandwich a small circuit board that contains the ROM of your choice. A notable omission

from this otherwise comprehensive kit is a set of labels to stick in the cartridges to identify their components.

The edge-connector that plugs into the socket on the Beeb has one foreshortened contact to ensure that all connections are made before the power is applied to the ROM. Because of this, cartridges can be exchanged freely with the micro switched on. Once in, ROMs are called by pressing Break and then addressed in the normal way.

The Micro Pulse ROM box can hold up to eight integrated circuits (including one in a zero insertion force socket) housed in a metal case with a hinged perspex lid. The box is manufactured to a high standard and uses good-quality components throughout.

Connection to the micro is via a length of ribbon cable with a DIL plug on one end that goes into one of the spare sideways ROM sockets on the Beeb's main board. Operating instructions come on two photocopied sheets and advise inserting the plug into the BBC with the cable facing left and the indexing red stripe to the rear — physically impossible. The cable actually runs out to the right of the machine and connects to the ROM box via a socket in its side.

Clamping the cable to the BBC is achieved by the Heath Robinsonish method of trapping it between the two halves of the case.

Once everything is set up, applying power to the BBC will illuminate one of

the eight LEDs. These are used to indicate which of the ROMs is chosen: selection is made by turning the switch fitted to the box. As with the Viglen, the appropriate ROM is enabled by pressing Break, although the instructions on the box suggest the rather more radical CTRL Break sequence.

In use


Each approach to using ROMs external to the Beeb has its pros and cons. Both suffer from the disadvantage that the selected ROM cannot be called without using the Break key first. Using toolkit ROMs in this way could prove awkward, and from Basic you will have to remember to OLD the program under development.

Any software that uses more than one ROM (*DataGem*, *Logo* and *ISO Pascal*, for example) is unusable with both systems since only one ROM is accessible at a time.

Verdict

The Viglen system is more elegant as there are no trailing leads hanging from the side of the micro when it is not in use. The price quoted for the system includes only one cartridge and you will need one for each ROM.

The Micro Pulse ROM box holds a maximum of eight ROMs, all available at the twist of a switch. Because of its flying lead it is not as neat as the Viglen, and this could cause trouble if the micro is to be moved around. A better method of fixing the lead to the BBC should not be beyond the wit of Micro Pulse's designers. Otherwise, the box seems to be good value.

I will seriously consider getting a Viglen system for ROM software that gets used less frequently. 

REPORT CARD: 1 TO 5

Features	●●●●
Documentation	●●●●
Performance	●●●●
Overall value	●●●●

Product Sideways ROM cartridge system
Price £19.95 (£6.95 per extra cartridge)
Distributor Viglen, Unit 7, Trumpers
Way, Hanwell, 01-843 9903

REPORT CARD: 1 TO 5

Features	●●●●
Documentation	●●●●
Performance	●●●●
Overall value	●●●●

Product ROM box Price £57.45 Distributor
Micro Pulse, Churchfield Road,
Frodsham, Cheshire, 0928 35110



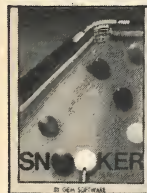
The Viglen is more elegant than the Rom box but the latter is easier to use.

SOFTWARE PRE-VIEW



We check out the latest contenders on the software market, and cast an eye to the future. Don't forget, if you want your company's package to be included on this page, send your latest releases to Bryan Skinner, PCN, 62 Oxford Street, London W1A 2HG, along with prices and 'phone numbers.

AMSTRAD



Just when you thought the Amstrad wasn't getting anywhere, Amsoft bring out Pascal, Kuma produces a version of *Logo*, and Arnor and Kuma release assemblers. The Pascal looks very good on paper at least, but the state of the *Logo* is less sure. Arnor's assembler is

superior to Kuma's *Zen*, outperforming it but costing £8 less. We'll be comparing the assemblers in the near future. Amsoft continues to release games for its machine, and it looks as if support from third party software houses is growing rapidly. Better still, software standards seem to be rising as well, as witnessed by *Manic Miner* from Software Projects.

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SPECTRUM



Gift From The Gods is Ocean's latest and it's rather better than the disappointing follow-up to *Hunchback* and *Kong*. You're in the role of Oristes, and if you think that's an odd name your mother's called Clytaemnestra.

But seriously, this graphic adventure is based on the Greek tragedy in which Orestes, aided by the Gods, must regain the Mycenae kingdom from his evil mother. To do this he has to find his sister Electra whom his mother has imprisoned in the catacombs below the palace.

The action boils down to the last bit. It's largely a maze-type game, the graphics are quite well done and the action tricky. Loading routines are getting more and more advanced. First the BBC used a counter so you could tell how long a game would take to load. Then many software houses wrote fast loaders for the Commodore 64, or licensed Novaload or Pavlod.

New Generation's *Technician Ted* adds to the range with an animated loading display. Ten coloured figures march to and fro and a counter indicates 'T minus' units.

The game is a difficult platform affair and a full review will be published soon.

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BBC

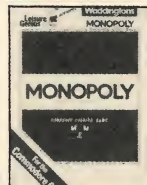


Some of Acorn's recent releases look promising, there are a couple of decent games like *Labyrinth*, and *Acheton* could easily become a very popular adventure despite its price. We'll be comparing Acornsoft's *GO* with another

soon, and it's interesting to note that neither version uses the full 19 x 19 board. Sound synthesisers for the Beeb have enjoyed considerable attention recently, the latest is Fsoft's *Music Maker*. This offers some 16 preset tones, tone envelope editing, keyboard mode, colour display and much more. Given the price it's an interesting product.

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COMMODORE 64



If you need a spreadsheet for your 64, you might take a leaf out of many an Apple user's book and invest in a copy of *Practical II*. For just under £70 you get a tried and tested product.

Melbourne House showed *Castle of Terrors* at the PCW show in September, but it didn't

release it till just before Christmas. It's an illustrated adventure which features animated characters but this isn't exploited as much as it could and should have been.

Leisure Genius continues to dominate the field of board game conversions for micros. Its latest is *Monopoly*.

Shoot the Rapids is an original and addictive game. It takes the unlikely theme of canoe simulation.

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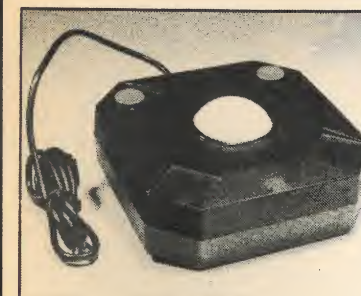
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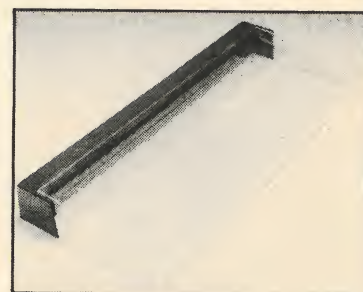
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SPECTRUM

THE BACKPACKERS GUIDE TO THE UNIVERSE, Pt I

Navigate caverns, avoid free-floating obstacles, collect items, decipher clues, and return triumphant to safety. It's a familiar recipe, but you may not have seen it served up as well as this for the Spectrum before.

The backpacker is Ziggy, faced not by the Universe but by the superbly designed Caverns of Exile. Ring wraiths patrol the caverns, where exotic creatures are exiled among the iridescent stalagmites and

corals. The scrolling is smooth and Ziggy's progress, whether on foot or through the air by jet-pack, is a treat to watch. His flame-thrower flickers like a lizard's tongue.

The game comes with more information than you can take in immediately. Coast through it a few times, rattling around the caverns like a pin-ball. Items go into Ziggy's backpack. Symbol Shift gives you a progress report on their status, but don't be dismayed by the news that the Googly Bird has died of a nervous breakdown. It's quite happy decaying slowly in the backpack. Later the status report will add Flook to news of the Googly Bird's demise, sug-

gesting that it was just hard luck that you picked up a neurotic specimen.

Many of the game's best



features turn up through trial and error. Short-cuts, barrier-breaching combinations of backpacked items, and hand-like rock formations all help you on your way. The time allowance is generous enough

for you to take your time. The main point of frustration is that the flame-thrower doesn't settle the ring wraiths' hash for very long — next time you visit one of their screens, they're back on patrol intent on causing you even more trouble.

Keys and a talisman are the ultimate objects of the game, and the talisman is due to come in handy when Part II is published. Part I should keep you entertained until then.

David Guest



Rating 8/10
Price £7.50 Publisher
Fantasy Software
0242-583661

BBC

JET BOAT

If there's any justice in the world this game will find its way into many Christmas stockings. It is excellent, from its redefinable control keys to its detailed graphics, from its smoothly scrolling landscapes to its icon-inspired 'time-up' alarm clock at the end of the game.

The concept of *Jet Boat* is nothing new — controlling cars around tracks has been the staple diet of a lot of games writers since time immemorial (well, 1980 anyway). The neat twist of using a boat is well

matched by the idea of holding it steady in the centre of the screen and scrolling the shoreline around it. The boat is



a good chunky sprite with at least 16 orientations and the archipelago around which you race against the clock (70 seconds a lap) is well populated with castles, villages, graveyards and so on.

First time out you'll have to get used to the controls. There are only three of them — left, right and accelerate. Unplug anything you might have in the analogue port, otherwise the keyboard controls may go crazy. You should try to remember the best route through the maze of islands, since the clear run you get on the first lap is not repeated until lap 16. Laps two to 15 involve negotiating an increasing number of obstacles, from boats to crocodiles, and ducks to sea monsters. A collision with any of these, or a bank, sets the screen flashing and slows you down to a crawl.

Rewards are small. Complete

a lap and you are greeted with the first bar of the *Sailor's Hornpipe* and the chance to go round again. The game soon becomes compulsive, though. It has a very responsive 'feel' — the boat decelerates smoothly as soon as you take your finger off the accelerate key, and turns corners promptly.

Jet Boat should acquire the kind of following that A&F's *Chuckie Egg* attracted.

Simon Williams



Rating 9/10
Price £9.95
Publisher Software
Invasion, 50
Elborough Street
London SW18 5DN

COMMODORE 64

KAMI-KAZE

It's fairly safe to say that this game is original — I'm sure I'd have remembered if I'd seen another set in a public convenience in Cleethorpes; well, not actually in the convenience (it's not that original), but the action takes place in and around this loo with a view half-way along Cleethorpes Pier.

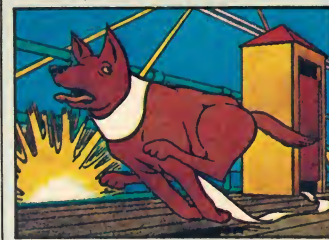
In fact it's not a loo at all, could our human eyes but tell, it's the flag-ship Argon of the Xenon battle fleet; but the men and dogs of Cleethorpes insist

on treating it as a convenience and so are using up the ship's vital battle plans in a most undignified manner.

The crafts that you control are much more conventional in design, move about at the touch of joystick or keyboard, and can rapid-fire in eight directions — even with a keyboard control, though that's rather more tricky. The loo is, naturally enough, at the bottom-centre of the screen, and men and beasts walk towards it from either side. You fly round above and must pop them off before they go about their business, otherwise each time one of them reaches the loo the paper-counter at

bottom right of the screen starts counting down.

Once they're inside there's nothing you can do, though you



can still shoot them when they emerge again. You have to shoot the dogs, of course, as the counter ticks away like mad when they're running off with the paper, but the drawback to

this is that the local RSPCA helicopter descends and starts firing at you. You've also got to watch out for low-flying aircraft and clouds — not to mention the choppers, of course. You also have four smart-bombs to aid you.

Kami-Kaze is a graphic delight, such as the way the dogs must jump up to reach the catch of the loo door, and the way the bodies topple over and splash into the sea beneath.

Mike Gerrard



Rating 8/10
Price £5.95
Publisher Supersoft
01-861 1166

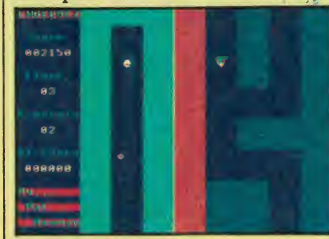
BBC

EWGEEBEZ

A maze by any other name... But, when Spectrum and 64 games are expanding into thousands of screens, it should at least be interesting to play one on the Beeb with 80. But with the limited memory available, what are the chances of an effective maze game? If *Eweebez* is the best attempt, not very high.

You play the part of Zelob the Melkon (whatever happened to John the Journalist or Roy the

Dynorod Man?) who has foolishly got himself stuck in the space station of the title. As



is the way with such artefacts, the station consists of a maze of little passages inhabited by various stationary nasties, as well as aliens from the neigh-

bouring planet, who beam in on the chance of a good bust up.

There is one ray of hope (sic) however. If you can retrieve the twelve power crystals and find the teleport before being split into your constituent atoms, you can escape.

The whole epic is shot in Mode 1, meaning that it's a little short of colour, but Matthew Newman has made the most of what's there by mixing them to produce various patterns.

There are three types of aliens — the bent VHF aerial, the Software Projects logo and the gnashing teeth — and they

appear in increasing numbers and are lethal to the touch. They don't shoot at you though, unlike the larger hostiles which send bolts bouncing around the corridors or extend long beams from their extremities.

The concept is not new, and although everything happens at a reasonable speed, there is neither the variety nor the challenge to keep you going.

Simon Williams



Rating 6/10
Price £7.95
Publisher Software
Projects
051-428 7990

COMMODORE 64

HENRY'S HOUSE

Another platform and ladders game this may be, but it features some of the best graphics and animation ever seen on the Commodore 64. The different high-resolution screens are a feast for the eyes.

Little Henry is about to take you on a romp through his amazing home. First stop is the clothes cupboard which contains an assortment of bags, gloves, hats and bow-ties. In order to progress to the next screen, Henry must collect all of these plus a key which appears only after he has grabbed a

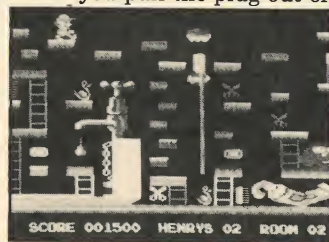
certain object in the room.

Some of the items are placed in really tricky positions and you have to plan the best way to get at them. Among the hazards in this bizarre closet are three giant boots that clump up and down and a whirling string of batty buttons.

Once Henry's gathered all the necessary objects, the screen changes to show him marching across an impressive hallway to the next room. One feature I particularly like was that on starting a new game you can opt to skip any previously conquered rooms.

The bathroom is really barmy and contains a huge grinning sponge, a squeezed tooth-

paste tube and the largest dripping tap and sink you're ever likely to see in a game. When you pull the plug out of



the sink, the water gurgles away and an enormous tooth-brush starts scrubbing away at a nearby set of false gnashers. Objects to collect include rubber ducks and plastic scissors. The kitchen is even kinkier.

It includes a fearsome food mixer, a powerful pop-up toaster and a twisting tin-opener. If you're clever enough to conquer the kitchen, there's Henry's lounge, playroom (with a marvellously impressive teddy bear), nursery, dining room and finally the deadly dungeon.

The graphics and animation are absolutely superb. There's a wide variety of excellent sound effects and the different challenges make this a game not to be missed.

Bob Chappell



Rating 9/10
Price £8.95
Publisher English
Software 061-835
1358

BBC

FIREBUG

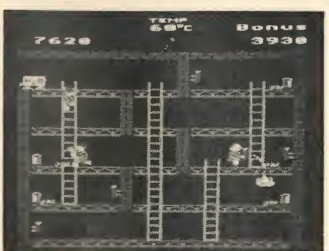
Not another platform game, running up ladders and along ledges! Well, not really. Although those elements are present, the idea is original and its neat execution provides one of the most hair-tearing, frustrating games I've played in a long while.

You act the part of a fireman who is desperately trying to deal with the chaos caused by a firebug. The young arsonist is doing his best to burn down the warehouse where the game is set.

He has an extended taper with which he lights fires on the

ledges. These gradually creep along the beams until they reach a wall.

Against this wall may be an extinguisher or, worse, a can of petrol. Either will explode on contact. You must take the cans



to the safety of the cold water tank in the roof, and put the fires out with the extinguishers.

Unfortunately, you can only carry one vessel at a time. And touching either the firebug or any of his fires knocks you to the ground floor. You can begin to see the difficulties involved in the game.

Each petrol explosion adds ten degrees to the temperature and at 100C the whole building goes up. There are three different screens. Screen three features two firebugs, while the fourth starts with a higher temperature.

The game is well animated, with the large figures moving convincingly around the screen. Sound effects are realistic rather than exciting, but since they're mainly bangs and squirts, this is reasonable.

There are a couple of minor problems with the game, however, which make it less enjoyable. On occasions, particularly at the higher levels, the swapping of extinguisher for petrol can doesn't always work. This can be very frustrating when time is tight. Also the placing of the jump key is awkward. With up and down being * and ?, and extinguish being Return, why on earth choose Shift for jumping?

A good game, despite these little foibles.

Simon Williams



Rating 8/10
Price £9.95
Publisher Acornsoft
0223-316039

SPECTRUM

3D STARSTRIKE

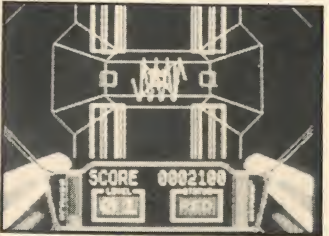
The title tells you a lot about this game — you're going to be either hurtling through space firing at missiles or hurtling along corridors. In fact you get to do both, though neither is a particularly thrilling experience for the seasoned Spectrum space pilot.

The intention is to get a direct hit on an alien base's reactor systems; but first you have to fly through space to get there. Having set your controls for the heart of the Kempston, Sinclair or Cursor joystick, or even the keyboard (a sensibly wide range of choices), you choose from the four skill levels.

Your sights are at the centre of your view through your cockpit, and sure enough strange objects start to come out of the screen towards you as you hurtle along. The panel at the bottom shows your shield strength, laser strength, skill level, score and status, this last moving from green through yellow to red.

The 3D effect is achieved by simple wire-graphics technique, which never seems altogether convincing to me, but at least it means you can get a bit more in. You rush headlong through space for about half a minute or so, and provided you survive (not too difficult) you then rush headlong just above the planet's surface, firing at more enemy

craft and also trying to shoot what appear at first sight to be goal-posts, but which turn out to be shoe-box type buildings — hit 15 of those for a bonus score.



Next comes the corridor sequence, with the same nasties to fire at, but with the addition of barriers across the corridor to fly under or over. Then comes a strange little sequence where your sights are apparently locked on to the reactor pods you're

after, so you fire furiously for a few seconds before it's back to the corridor to make your way out (which is much like making your way in).

After that I'm not sure as this was usually where my shields gave out and the game abruptly stops, showing you your score and giving you a chance to start again. There's no high score table, but that's no great loss as I can't see many people wanting to knock up high scores at this graphically limited game with poor sound and few thrills.

Mike Gerrard



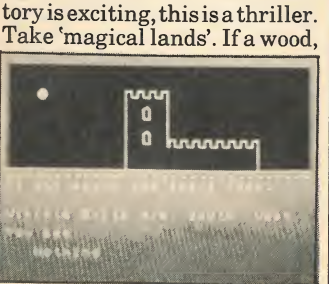
Rating 4/10
Price £5.95
Publisher Realtime
Software
0532-458948

SPECTRUM

BLACK TOWER

If only *Black Tower* had been as good as the cassette inlay said — I'd have had a great treat. Boredom, however was the main outcome.

Let me translate some of the inlay's hyperbole for you. Take 'exciting'. If an excruciatingly slow response coupled with the most mundane text seen this side of a telephone direc-



tory is exciting, this is a thriller. Take 'magical lands'. If a wood, a large forest, a huge forest, a pub and a hut are magical lands then welcome to Oz.

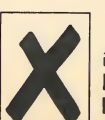
Take 'exciting people'. I met one, a character called Josh about whom I was told absolutely nothing. Any attempt to examine an item was stonewalled with 'Curiosity killed the cat.' Take 'interesting places'. If location graphics that would shame a three-year-old are 'exciting', my doodles should hang in the Tate. The 'difficult problems' part, turned out to be true — the problems of keeping awake.

What can you say about an

adventure that, when fed with the verb ZQX (or any real word it doesn't recognise), responds 'You can't do that... yet'. Yet?

I placed *Black Tower* in the slot of my magical one-armed bandit and hit the jackpot — three raspberries.

Bob Chappell



Rating 2/10
Price £6.50
Publisher Dollarsoft
0742-363246

SOFTWARE PRO-TEST: BBC

TMS GETS A SPIN

Make your musical dreams come true with The Music System. Simon Williams says this music generator beats the competition hands down.

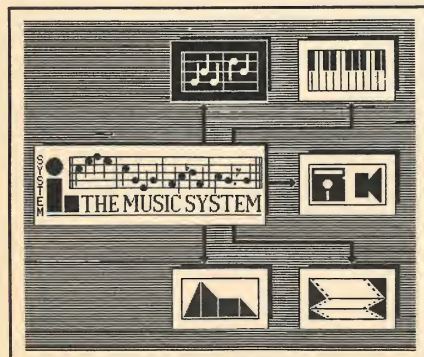
The 1984 prize for software package design goes to *The Music System* TMS by my reckoning. Not only is it the most comprehensive synthesiser software for a home computer, but it beats most of the competition with its intelligent use of graphic symbols (icons) and the way it groups and sub-divides its functions.

TMS is available either on two cassettes, or on a 40/80 track disk, with a further library disk of jolly tunes. It comes with an excellent 76-page manual and a function key strip.

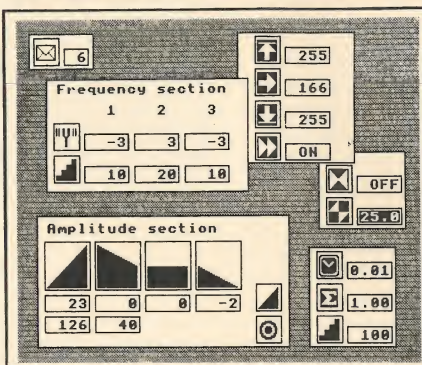
In use

I used the disk version of TMS but differences between the two systems will be pointed out where appropriate. On booting up the main disk, the 'control screen' appears. This is your first look at the style of display adopted throughout. It consists of five large icons indicating the various modules of the system, a strip showing the title and a piece of music manuscript across which notes scroll smoothly from right to left, echoing the display used by the Editor module. The five icons represent the Editor, the Keyboard, the Linker, the Printer and the Synthesiser. The space bar highlights each icon in turn in reverse video and the Return key will make the selection. This technique is repeated within each module for selection of items from a given menu.

The Editor is essentially used for entering music note by note on a conventional pair of treble and bass staves. The initial menu covers system parameters such as the name of the current music file, key signature, tempo and number of bars entered in each voice. There are four voices, corresponding to the Beeb's sound channels, with the fourth being used for percussive sounds (not available on cassette). A composition previously entered, or any of the library pieces (of which there are many) may be played in up to four parts from this menu. Once the main editor



Starting point: the control system.



Complex settings of the Synthesiser.

has been entered only the selected voice is heard on playback.

An interesting feature which can be called from this menu allows you to transpose a piece of music automatically. This can be done from any key to any other, assuming none of the transposed notes falls outside the pitch range of the system. The manuscript display is updated accordingly. The main Editor allows entry of individual notes by positioning an arrow cursor, and using the up and down cursor keys to shift the note's pitch and the Q and W keys to change its duration. This proved very easy, since it is possible to play the music back at any stage. The volume and envelope of each note and the time signature and tempo may be altered as you wish.

The Synthesiser is the most complex of the five modules as it deals with the enveloping system of the BBC micro. TMS struggles bravely to sort it all out and provides three levels of display. The first level, like that on the Editor, allows system parameters to be altered. Two sets of 15 envelopes may be maintained in the system at any time and individual envelopes may be copied or swapped between the two sets, which allows great flexibility. Files of envelopes may be saved in either 'music' or 'BBC' format. The former is for use within the system, but the latter allows the envelopes to be saved in a form that may be accessed straight from Basic — useful if you want to use TMS envelopes in your own programs.

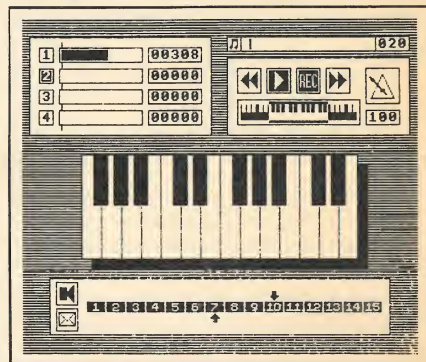
The second screen display shows all the envelope parameters divided into the appropriate frequency, amplitude and timing sections. Any parameter may be altered by selecting it and using the Q and W keys (good to see consistent use of the same keys throughout the system). Switching from one section to the next (space bar again) puts the cursor onto the parameter within the section that was last altered. This allows easy alteration of a pair of parameters

within different sections to see how their varying combination affects the overall sound. The third level of display shows the actual frequency and amplitude graphs. The parameters may be altered from this screen too.

The Keyboard module allows you to use the QWERTY keys on the BBC to play and record music 'from the source'. To this extent it is a better executed version of previous music processor programs. Here, though, there is an on-screen animated metronome, a keyboard display which shows you the notes as you hit them and a full digital recorder which copies your magnum opus as it all flows out. The current volume and envelope are displayed, as are bar graphs of the number of notes played in each voice.

The Printer module reproduces manuscript on an Epson compatible printer. It produces draft or manuscript quality printout at different speeds.

The Linker module attempts to overcome the only shortcoming of TMS, the rapid use of available space. By switching to a Mode 7 display and loading and linking several files, long pieces can be



Keyboard 'play' display.

played from their component parts. Indeed, the library file named 'Longest' lasted well over five minutes and wasn't a protracted funeral march.

Verdict

I haven't yet explored the whole system. Although the possibilities of obtaining music from the BBC may have been 'limited only by your imagination', the advent of TMS brings this computer cliché much closer to the truth.

REPORT CARD: 1 TO 5

Features	●●●●●
Documentation	●●●●●
Performance	●●●●●
Overall value	●●●●●

Name The Music System Application Music Generator Price Cassette £12.95, disk £24.95 Publisher Island Logic 01-741 1511 Outlets Retail.

SOFTWARE PRO-TEST: IBM PC

WORD-PERFECT

The word processor that claims to have everything is checked out by Geoff Wheelwright

With all the Wordstars, Microsoft WORDs and Easywriters in the world, you might wonder if anything else could be added to the electronic wordsmith's toolbox. However, a US company has done just that.

Rather than taking the popular route of developing a minimalist word processor and selling it cheaply or adding it to a group of other minimalist applications in the form of an integrated suite, Samna has tried to put every conceivable word processing feature in one package, Samna Word III.

Features

Features include full footnote and indexing facilities, multiple documents displayed on screen, print spooling, software selectable international character sets, keyboard-generated box and line drawing, newspaper-style printout in parallel columns, a built-in 'calculator', unlimited horizontal scroll display, spell-checking from an abridged version of Webster's New Collegiate Dictionary and a direct typing mode.

The inclusion of several international keyboard configurations indicates a cultural appreciation often lacking in American packages — although a few of the configurations look doubtful to me. The French, Spanish, German and Greek keyboards all seemed straightforward — but the inclusion of English (UK), English (American) and Canadian keyboards is an example of overkill. (The Canadian keyboard allows you to generate all the characters needed in both French and English).

Not everyone needs all Samna Word III's features — or wants to pay the whole £485. So, the company is offering two other versions; Samna I at £260 and Samna II at £395 — each of which strips some of the features off the Samna III configuration.

Documentation

The documentation is thick and comprehensive. It comes in the standard ring binder and divides into seven sections; a 'road map', visual guide, introduction, alphabetic function description, appendices, index and 'tips and tricks' section. The size is a bit intimidating, but assimilating the documentation is eased by the use of the unique 'road map' and visual guide.

Although I didn't make much of the 'road map' — a series of sample texts showing ordinary printer's editing marks and where information on them

could be found — they would be helpful to the novice. Much more help was the 'visual' guide, which uses a combination of screen shots and symbols to provide an alternative to the standard table of contents or index.

The other plus was the existence of 'how-to' boxes, which step you keystroke-by-keystroke through what you must do. This doesn't make much difference on simple commands readily accessed with a keystroke or two — but on something like mailmerging, it is a boon.

initially disconcerting. (Most IBM packages put Help on F1 and Undo or Cancel on the Escape key). Once settled in, however, Samna Word III started to impress. For a start it is incredibly quick.

Experimenting with some of the unique features proved equally satisfying. To make boxes and enclosures on screen, for example, you only need hold down the Control key and one of the cursor keys. Carriage returns are moved about as needed to make the boxes



Samna Word III — in a crowded word processing market, it sets out to do better than the rest.

In use

The first thing you notice is that it takes a minimum of 256K RAM and two disks to get started. The first hints that a meaty package is at hand.

Not only do you need two disks to get started, but the printer drivers, dictionary and tutorial also have disks to themselves.

Once booted up, the program presents itself as a blank screen with column, page, left and right margin and tabbing details along the top and something resembling wallpaper on either side. This entry-mode is known as the 'scratch-pad' area, which means you're working in memory and don't have to immediately give a file name to your work. Once you start to type enough text to approach the limits of that memory — or you request to save the file — you are prompted for a filename and come out of 'scratch-pad' mode.

Operation is much the same as on most IBM word processors, although I found the placement of Help on the Escape key and Cancel on the PRTSC * key to be

'whole' without disturbing any text inside them.

The other notable plus was the extensive dictionary — but that plus was marred by the fact that it requires lots of memory to use (more than the 256K in my little machine) and resides on a separate disk from the program. It's one of those trade-offs between power and accessibility.

Verdict

Samna Word III is impressive, with many more features than there's room to mention. It lacks a word-count facility, but then considering how much else is in the package, I won't quibble.

REPORT CARD: 1 TO 5

Features	●●●●●
Documentation	●●●●●
Performance	●●●●●
Overall value	●●●●●

Name Samna III Price £485 Application Word processor System IBM PC/AT or compatible +256K RAM Other versions None Outlets CBIS Intl 01-930 6083.

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Amstrad Software: Manic Miner, Roland in Time, Punchy Electro, Freddy, Haunted Lodges, Harrier Attack, Character Generator, Program Copier etc. Tel: Markon Washford 40599 after 6pm.

Amstrad Software: Spannerman, Roland in Time, £4.50 each. Tel: 021-453 8876.

Amstrad CPC 464 colour monitor + 2 games, £290. Also Oric + software, £90. Tel: Gosport 520204.

Amstrad CPC464, green screen. Three months old. Hardly used. Excellent condition. £175 ono. Write Paul O'Neil, Northbank, Beacon Street Penrith, Cumbria.

Amstrad CPC464 + colour monitor and two games. Also articles and magazines, £290. Also Oric-1 + software and attache case. Tel: Gosport 520204.

Amstrad Software for sale, Original Harrier Attack, Code Name Mat, Colossal Adventure Return to Eden, £5 each. Tel: Steve 01-672 2509.

Amstrad Games: Hunchback Electro Freddy, Oh Mummy. Swap for any level 9, Arnold or Roland software, £5 each, all £12. Stephen Rae, 190 North Gower Street, London NW1.

Acorn

BBC 'B' eight months old, excellent condition, complete with graphics ROM, software books and leads. Worth £490, only £350. Tel: Banchory (03302) 3307.

BBC Software to sell or swap. (Originals). Large collection, under 1/2 price. Tel: Welwyn 4053 or write Sean Kerrigan, 23 Heathrow Road, Oaklands, Welwyn, Herts AL6 0QG.

BBC Warp 1 (Icon), £5, and Hobbit, £12. Both unwanted gifts and have never been used. Tel: (0449) 721835.

BBC Z80, second processor plus software pack. Also Opus dual d/drive 40/80 track. Both two months old, selling for only £595. Tel: Brighton 36359.

Wanted BBC B O.S. 1.2 FDFS if possible. Please Tel: John on 0642-484785 (north east England).

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Selling Electron A/D converter, flash-gun, sunlamp, darkroom exposure meter telescope, vintage records, Spectrum 1/0 Port, racing bicycle. Sell or swap for Psion. Tel: 0408-21870.

Acorn Electron, £60 worth of software, leads and dust cover. Total cost £270, sell for £190 ono. Tel: 0233 27457.

Electron Games for sale, Elke, unwanted gift, £10. Twin Kingdom Valley, £4.50, Cylon Attack, £4. Tel: 061-368 6935.

BBC disk drive, SS 40TK, 100K, (200K double density). Opus case with PSU and space for second drive, sell £150. Tel: 06285 21206 (evenings).

BBC B with Wordwise, graphics ROM, lots of software, books, joystick. All for £300. Microvitec 14in colour monitor, £150. Tel: Simon on 0732-833108.

BBC Originals for sale. Arcade Action, Philosophers, Quest, Arcadians, £5 each. Also games to swap including Donkey Kong and Donkey Kong Jr from Atarisoft. Tel: Steve on 07073 34513.

BBC B 1984 and Acorn joysticks, £335. Prism modem 1000 and ROM, unused, £65. Software worth £130, only £45. Tel: 01-204 6285 after 5pm.

BBC B 1.02OS with Data recorder books and software mostly adventures (Hobbit, five level 9's etc), £295. Tel: Roy on 0902-332076.

BBC B six months old. Best offer over £250. Tel: 0604-30719.

Commodore

Wanted. I will pay good prices for your C64 software. Send price list etc to Andy Moore, 4 The Rooley, Huyton, Liverpool L36 5XJ.

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CBM64 software swap. Sell over 40 titles: Hobbit, £5. Level 9 Adventures, Manic Miner, Beachean Games, Designer Quill. All £5. Tel: Taylor on 07712-3214.

CBM 1541 disk drive with software. Absolutely perfect condition. Unused. £185. Also Microdrive + 1/F1 + cartridges in similar condition, £80. BBC matrix printer, £60. Tel: 01-863 5113.

Exchange Commodore Printer model 4023. Business model, unwanted gift, new. Will exchange for Commodore 64 disk drive. Tel: 01-890 0934.

CBM 64 Owner wants to swap software. Have many good titles. Wants to buy joystick and mag/books. Send list to Jonny Mikalsen, Box 124, 5460 Husnes, Norway.

Vic-20 + cassette recorder + super expander + 3 carts (Jupiter Lander, Jelly Monst, Adventureland) + 3 tapes (Arcadia, Catcha, Panic) + joystick + 5 blank tapes, £99. Gary Bennett, 25 Broughton Rd, S.L.E., Leicester.

Vic-20 16K, switchable, tape recorder, joysticks, over £300 worth of software (50 tapes) + about 100 mags. Only £120 onvo. Tel: Southend (0702) 72238.

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Commodore 64 Software Sale: Football Manager, Chinese Juggler, etc. Also Pixstick lightpen with paintbox program + 3 games for £25. Tel: 0823 74410 ask for Steve!!

Commodore 64 Software. Swap Lazy Jones, Star Commando, UGH! Music 64, Gridtrap, Skramble, Kong Galaxy, Hunchback and more. Steve, 2 Ash-over St, Gorsehill, Stretford, Manchester M32 0HG.

CBM 64 swaps. Jammin', Metro Blitz, Bath Time, Exchange for Chuckie Egg, Sheep in Space, Ancipital. Tel: Southampton 0703 847168.

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Programs — Exchange CBM 64 disk. Have over 1,000 programs, will send complete list in return for yours if extensive. Per Nilsson, PL5281, S-44193 Alingsas, Sweden.

Wanted CBM 64 software tapes — intro to basic — games — what have you — books etc for beginner. Write Moffat, 42 Pennine Rd, Woodley, Stockport, Cheshire SK6 1JS.

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Oric software swaps Dinky Kong, Killer Cavens, Oric Flight, Quark Flight, Simulator, Multigames One, Home Finance, Teach Yourself Basic. Tel: after 7pm Lancing 762361.

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Oric software for sale. Selling all my originals, over 50 at near half price as have sold my Oric. Please ring! Tel: 01-485 8393.

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Spectrum software Atic Atac, Penetrator Pimania Groucho, and many more — all originals £3 each. Tel: 061-775 3213.

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Spectrum 48K good as new over £80 worth of software, Kempston Interface with Quickshot 1 joystick and data recorder. Price £140 ono. Tel: Lanreath (0503) 20398.

48K Spectrum + Com-Com joystick interface + Quickshot II + tape deck + over £600 worth of software + mags. £190 ono or swap for Commodore 64 with C2N cassette recorder. Tel: Halifax 67827.

Wanted Spectrum 48K — £70 offered, working order. Also some peripherals. Tel: Dave on 051-424 5558.

48K Spectrum, 100% reliable, cassette recorder, Currah Speech, £100 software, £50 books, mags etc. Boxed with 1 months guarantee. Perfect condition £140 ono. Tel: 01-863 5113.

48K Spectrum ZX printer, interface 1, Microdrive, five cartridges, tape recorder, RS232 printer interface board and cable, case, £120 worth software, £200. Tel: Keith on 091 264 3439 after 6pm.

Spectrum programmable joystick interface, made by Stonechip, boxed and with instructions, must sell, yours for only £16. Tel: Fyfield 291 after 5.

ZX Spectrum games, over 60, all originals, includes Ultimate, Quicksilver, Imagine etc, all as new, offers over £60 for all. Tel: Reading (0734) 712255 evenings.

Eighteen Spectrum software tapes £3 each. All originals, also The Hobbit, Games Designer, £7 each. Pyston £5. Magazines and books. Tel: 021-474 6043.

Wanted 16K ZX81 and printer. Have to be in perfect condition, will pay up to £75. Ask for Richard. Tel: 24025 (West Yorkshire).

Spectrum, only six months old, two 48K RAM packs and dust cover. All manuals and leads supplied. Quick sale £120. Tel: 01-891 0496.

ZX81 16K+ £200 software. Boxed, manuals, leads, magazines £50 ono. QS sound and characters boards £30 ono. ZX printer £20, J. Millott, 50 Sydenham Road, Croydon, Surrey.

ZX81 Forth ROM with all manuals. Hardly used £25. Tel: 01-733 7188 after 5pm.

Spectrum software: Scrabble £8. Games Designer £7. Match Point £4. JSW, Visions Snooker, Trashman, Bugaboo £3.50. Jetpac, Cookie, CDS Pool £3. Tel: 021 453 8876.

Spectrum 48K only six months old VGC. Some software, cassette recorder £120 ono. Tel: 01-590 4849. Write T. Holloway 32B Belgrave Road, Ilford, Essex.

Spectrum 48K ZX printer, data recorder, transform keyboard (needs repair) software, books, magazines, £150. Ferguson IX TV £140. Tel: 01-866 4797.

Spectrum 48K + Turbo interface with ROM cartridge port + Quickshot 2 joystick + £50 original games. All worth over £200 with original boxes. £150 ono. Tel: 031 337 0200 after 4pm.

Spectrum Software Sabre Wulf £5. Lords of Midnight £5. Jet Set Willy £2.50. Atic Atac £2.50, or swap any for Amstrad software. Tel: 0294 56010.

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BBC B wanted. Exchange for CBM 64, C2N, 2 joysticks + ass/diss/mon, books, games. Value £430. D. Foyston, 79 Bewholme Grove, Marfleet Lane, Hull, N. Humberdale.

BBC B O/S 1.2, Wordwise ROM, two data recorders, joysticks (3), cables for printer software, Elite etc, plus books, mags. Swap for Commodore 64 system. Tel: (0900) 65614.

BBC Software for sale. Mostly games and adventures, some serious, including Mail Merge for £10; also Acorn Z80 software. Tel: 0788 812940 after 6pm.

Wanted: BBC (disk) owners to exchange programs and ideas. Many titles available including, Jet Boat, Sabre Wulf, Elite, Manic Miner, and more. Tel: (05827) 69152.

BBC Elite £10, Castle of Riddles, Carousel, Starship Command, all £5 each or £12 the lot. With Elite you get competent file which has 100,000 credits, plus every weapon. Tel: 551-2947 (Essex).

BBC B, + DFS + 100K disk drive + Wordwise + Exmon. £399. Seikosha GP80 printer + 4000 sheets paper, £89. Tel: (0223) 277236.

BBC Dual 80T double sided disk drive, own PSU only £300; FX80 printer only £290, both vgc, boxed and with all leads, had light use. Tel: Colin, Uxbridge (0895) 35129.

BBC Wordwise. ROM + manual, only £25; DDT MASS ROM manual, only £20; advance user guide (hard cover) only £10. All vgc. Tel: Colin, Uxbridge 35129.

BBC software many original titles less than ½ price, including Aviator, Countdown to Doom, French Mistress, Spitfire Command. Also Basic book. Tel: Cambs. 240638.

BBC £100 ono for 200K 80 trks disk drive, cables, utility disk and manual supplied. Tel: Benny on 01-439 0192 (Mon-Fri) between 6.30pm and 7.30pm.

For BBC genuine Watford Beebfont £25 complete. GCC ROM expansion board £25. Tel: 0604-844130 or write with s.a.e., Emmerson, 71 Falcutt Way, Northampton, NN2 8PH.

Electron + tape (Acorn) + many games (inc. Aviator + Twin Kingdom Valley) + 2 extra books + many mags, £220. Tel: 0642 551049 after 4pm, ask for Peter.

BBC software. All original. Snowball, Hobbit, Fortress, Graphics Composer games education 4-8 years, Viglen sideways ROM system. Tel: Basingstoke 51623.

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Atari VCS plus 13 cartridges including, Jungle Hunt, Popeye and Asteroids, good condition. Bargain at £130 ono. Tel: (Sheffield) 873785, weekdays after 4pm.

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Atari 810 for sale. Brand new, only £75. Also Tanktics disk £7, Star Raiders £8, Defender £8, Preppie cassette £10. Tel: 60078 (Harrogate), ask for Richard.

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Atari printer, 1027 letter quality. Nearly new. No interface needed £180. Tel: Chesham 0494 784409 after 6.30pm.

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Atari 400, 16K + basic and manuals + magazines and software £65. All offers considered. Tel: John 01-684 3775, after 8.30 evenings.

Atari 2600 games for sale, Championship Soccer, Crossforce and Asteroids each costing over £20, only £6 each. Tel: Andrew or Richard 0484 605808.

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Atari software swap or sell also wanted disk drive. Tel: 0904 791067.

Atari 400 + recorder + basic + manuals + joystick all boxed and in mint condition plus over £200 of tapes sell for only £130. Tel: 467 8854.

Atari 400, cassette recorder, joystick, 5 cartridges, cassette software, manuals, mags, good condition, £125 ono. Tel: Paul (0533) 775456.

Atari software Dig-Dug, Missile Command, Chicken, Pilot, ROMs £5 each. Leggit, Galactic Chase, Up, Up and Away, cassettes £3 each, also many more on cassette and disk. Tel: 01-550 0931.

Wanted: Atari magazines and books including Antic and Your Atari Computer, also cartridges and disks to swap. Tel: Peter, Middlesbrough (0642) 823882.

Atari disk and cassette software for sale of swap, and ROMs for swap only. Tel: M'bro (0642) 823882.

Atari disk and cassette software for sale or swap and ROMs for swap only. Tel: Middlesbrough (0642) 823882.

Atari 600XL as new and still under guarantee. BFR5000 ono. Tel: Brussels 235-3228 (office), 12 Opemstraat B3, 1980-Tervuren.

Atari 400/800 software for sale, all new (including Pole Position etc) £5 each or £45 for 10 or £80 for 20. Tel: 021 749 4603.

For a quick sale. Atari VCS, 12 cartridges, joysticks, paddles, touchpad, keyboards, video games cases. Good condition, £130 ono. Tel: Paignton 0803 524448. Buyer must collect.

Atari software for sale or swap. Zaxxon, Preppie, Encounter, ACE, Diamonds, Mutant Camels, Dimension X, Zeppelin. Tel: 0904 791067 after 6pm.

Atari software (originals), Visicalc £35, Filemanager 800+ £25, Macro Assembler £12, Time Wise £9. Plus games. Tel: Slough 71392, after 8pm, (anytime weekends).

Games to swap, and sell. Deadline, Dungeon, Adventure, Star Raiders, Snowball, Caverns of Khafka plus more. Tel: 051-327 1780 after 5pm please.

Wanted Atari 1050 disk drive. Tel: Notts 0602 818977.

Atari disk drive wanted. Any make but must be in very good condition. Tel: 0207 503777.

Original Atari software, ROM assembler editor £15, Pacman £10, disk, Summer Games £10. Many cassettes, too many to list, Zeppelin, etc. Tel: Mansfield 0623 556432.

Original Atari software, disks, Zaxxon, Caverns, Mission Impossible, Strip Poker, £10 each, the lot £30. Snooker, Finance Manager, cassettes, £5 each. Tel: Mansfield 0623 556432.

Atari disk drive wanted. Pay up to £120. Tel: 0207 503777.

Wanted Star Wars for the Atari 800XL. Will pay a good price. Tel: Wendover 0296 623423 after 4.30pm, ask for Alistair.

Atari 400 with Basic and Manual still guaranteed, £50. Also tapes to swap,

Fort Apocalypse etc. Tel: Wrexham 753238.

Atari 810 disk drive for sale. With home filing manager disk, £170 ono. Plus some software, only one year old. Tel: (0792) 898363 (eves only).

Commodore

Zork I (infocom) for Commodore 64 (disk). Sell £7 or swap. A superb adventure. Tel: David (0783) 227262 (after 6pm).

CBM 64 games, for sale or for swap, games include: Practical £15; Frogger 64 £3; Hustler £3; Ceasar the Cat £4; Crazy Kong £4. Write to: Neil Reynolds, 55 Leam Crescent, Solihull, West Midlands B92 8PB.

Vic 20 software Trax £3, Jetpack £3, Mission Mercury £4, Vixen RAM (switchable) £20, Super Expander £22, Alien Cartridge £3, Wacky Waiters £2. Tel: 0302 845025.

Vic 20, C2N, 8K ram, super expander, joystick and over £180 Software. Programmers Reference Guide and other books. £150 ono. Tel: Evesham (0386) 41135, after 6pm.

Vic 20 games Trax £3, Jetpack £3, Blitz £1, Wacky Waiters £2, Catcha Snatcha £2, Super Expander £22, Vixen Switchable 16K. £20 vgc. Tel: (0302) 845025.

Pet 4000 series 32K 12" screen computer, cassette type 2CN, printer type 4022 IEEE cable. £495 ono in as new condition, suit business. Tel: Portsmouth 827276.

Commodore MPS-801 printer for sale. Excellent condition. With paper and ribbon £150. Tel: Portsmouth (0705) 750595.

Vic 20 plus C2N and games £80 ono. Tel: Wigan 48999, good condition, calls after 5pm.

CBM64 software to Swap: Ghostbusters; Matchpoint, Raid Over Moscow etc. Send list to: G. Woods, 201 Fallsbrook Road, Streatham, London SW16 6DF.

Commodore 64 with data recorder and crackshot joystick and over £100 worth of software and guarantee extended. Sell for £290 ono. Tel: 061-881-1144.

32K Pet (Basic 2 AMD 4) £300. Epson printer MX100 £200 MX80 £180. Koala pad (C64) £40. Tel: Tunbridge Wells 0892 26016.

Commodore 64 with data recorder and crackshot joystick and over £100 worth of software and guarantee extended. Sell for £310 ono. Tel: 061-881-1144.

Wanted Commodore 64 with no extras. Will pay up to £95. Tel: Graham, Potters Bar 50336.

CBM 64 games half price. Ghostbusters, Football Manager, Decathlon, Natocommander, Heathrow, Rustler, Backgammon, Stockmarket. All originals. Tel: Bristol 837617.

Commodore 64 with data recorder and crackshot joystick and over £100 worth of software and guarantee extended. Sell for £300 ono. Tel: 061-881 1144.

Dragon

Dragon 32, excellent condition, new joysticks, dustcover, books, over £100 software, Ferguson tape recorder. Many user magazines. All only £150 ono. Tel: Harrogate 503125 (after 5pm).

Dragon 32, £150 of software, two joysticks, cassette recorder, all leads, manual, users books. Sell for £130 ono. Tel: Swanley 68339.

Dragon 32 for sale plus £52 s/w, cassette recorder mags worth over £287. Sell £100 ono or swap for CBM64 and C2N. Tel: Chris 01-387 2553.

Dragon 32 with books, games and cassette recorder. Also Dragon user magazines, and as much advice as you need. £69 ono. Tel: 0272 40872.

Dragon 32, bargain. Joysticks, books, user magazines, including copies of Dragon User, software including Ring of Darkness, Gridrunner and more. Everything boxed; worth £280; sell £60 ono. Tel: 01-903 1770.

Dragon 32, over £100 software. All leads, magazines included, boxed, in excellent condition. Sell for £75. Tel: Romford 24508 after 7pm.

For Dragon 32 one Sprite graphic board from Premier. Gives 16 colours plus sprites. Hardly used, £75. Tel: Honington 03596 218.

Dragon 32 plus cassette recorder plus joysticks and software inclusive. The King Chess (cart) and magazines and book. Boxed as new, £150 ono. Tel: 01-366 6736.

Lynx

Lynx 48K CW joystick and interface, Serial printer interface, software and manual, all as new. Cost £280, will accept £140 ono. Tel: Macclesfield 20055.

Lynx 96K leads, manuals, introductory cassette. Serial interface, Machine code monitor inbuilt. Unwanted gift. £160 ono, or swap 48K Spectrum plus extra's. Tel: Mark, 01-864 7953 (Greenford).

Lynx 48K complete with cassette player, games and utility programs, books and user magazines. £100 ono. Tel: Leeds (0532) 770772 after 6pm.

Lynx Software for sale. Sea Harrier, Sub Chase and Invaders, plus free demo tape and manual. £6 the lot. Tel: Teerchry 0443 775691.

Lynx 48K. Hardly used, cassette deck, 4 software tapes, manuals and 2 books. £120 or near offer. Tel: 01-661 0744.

48K Lynx with manual, leads, etc and including book, newsletters, demonstration tape and 3 games. Price £80 ono. Tel: Sellindge 3217.

Oric

Oric Atmos 48K, tape recorder, £100-worth of software—all the best games, plus Oric mags. Will sell for £150 ono. Tel: Great Missenden 6127.

Oric 1 Software, surplus to requirement; Onbase, Probe 3, Vanquisher, Paragram, Painter, Gobbler, Xenon 1, Zorgon, Ultra, Oncomon, Oricide etc., (originals) £2-£7. Tel: Steve, (Sandy) 0767-292119.

Wanted. Oric (Atmos) Software. Games and/or utilities, especially Basic extensions, Assemblers and The Hobbit. Tel: Oxford (0865) 512091. Ask for Alexander.

Oric 1 16K, with software, books and magazines, worth over £130. Sell for only £35 ono. Tel: Leicester 897878.

Tandy

TRS-80 Model Two, £2,000. Needs repair. Buyer sends me repair bill. Used nine months 1981. David Pratt, 9 Larkins Lane, Stoke Poges, Bucks. SL2 4JU.

Tandy TRS-80 16K colour computer. Hardly used, Basic manuals, joysticks and over £150 of software. Accept £250. Tel: 01-337 4592 (eves).

Tandy TRS-80 Model 1, Level II 48K, internal, lower case, joystick, printer interface. Boxed. Manuals. Some software. Bargain: £150 ono. Tel: Simon, 05827 68663 after 7.30pm please.

16K Tandy colour computer with extended Basic, joysticks, manuals, books, Project Nebula games cartridge and all leads. £140 ono. Tel: Sheffield 365599.

Tandy TRS-80 Model 1, interface, 32K. Offers? Various books Basic graphics, excellent condition, ½ price, CAT 62-2069, 26-2107, 62-1002, 62-2073, 62-2087, 26-2116, 62-2063, 62-2064. Tel: 0324 812470.

Free Tandy 32K colour computer plus £400 Proff software with purchase of dual disks for £400. Tel: 0525 714488.

TRS-80 Model 1, level 2, 16K including monitor and software. Needs attention, £75 ono. Tel: Woking 67454 (eves).

Apple

Apple II+ Look-a-like Never used, some software on disks and cassette, including Visicalc, data recorder all 12 mths old. Genuine reason £350 ono. Runcom 77140. Bargain.

Wanted Apple software. Send list of prices to Ayo Lawani, Downside School, Stratton on the Fosse, Bath BA3 4RJ. Please include phone number.

Peripherals

Alphacom 32, printer for Spectrum, £50 ono. Also DK'tronics double joystick interface £10 and large collection of Spectrum software. Tel: 01-203 0324 (after 6pm).

Spike speaking Vectrex cartridge £10. Also Acetronic cartridges Shoot-Out, Tank/Plane Battle £8.50. Soccer, Air/Sea Attack £5. Excellent condition packaging. Everything includes postage. Tel: 01-802 8724.

Prestel adaptor and Coleco vision TV game. Sale or swap. Poss Spectrum WHY. Tel: 01-223 5491, (day or night). Peter.

Intellivision for sale with cartridge £55, also Astromash, Armourbattle, Lock-n-Chase, Subhunt, Golf + Advanced Dungeons and Dragons, £10 each. Excellent condition. Tel: 01-802 8724 (eves).

Microvitec colour monitor 14in 1441 vgc. Will swap for portable colour TV or any Spectrum hardware. Mr. Rooney, 7 Redhill Ave., Southdene, Kirkby, Liverpool.

Swap excellent Honda 250cc, T-reg. bike for dual 80 track drives for BBC. Will also sell for £250. Tel: 01-961 1655 (after 5pm — Derrick).

VTX 5000 Modem for Spectrum. Cost £99, sell for £60 ono. Connector included. Tel: (Bodfari) 0745 75425 (after 6pm).

Colecovision cartridge Qbert £10. Intelivision cartridges Tutankham, Supercobra, Novablast, White Water, Safecracker £10 each. Eight others from £8 each. Full details. Tel: 01-764 4075 (eves).

Epson MX80 type 3 printer £150 ono. Also parallel interface for Apple. Tel: Anthony 01-578 7704 (after 7pm).

Epson HX20 16K portable with printer and micro cassette unit. As new £320. Tel: 0904 760351 (after 6pm).

Wanted, Polymorphic system 8813 boards, especially 16k RAM. Would like to hear from users of 8813 or system 88. Tel: 0602-506101 ext 3136, 0602-251920 (eves).

Brother HR-5 RS232 printer, with mains adaptor £150. Tel: Glasgow 041-959 6125 (ask for Gregor).

Selling electron A/D converter, flashgun sunlamp, darkroom exposure meter, telescope, vintage records, Spectrum I/O port, racing bicycle. Sellers swap for Psion organiser hardware. Tel: 0408-21870.

For sale Electron A/D converter flashgun sunlamp, Zoom telescope 40 approx. vintage records, darkroom exposure meter, Spectrum I/O port, racing bicycle, Sinclair P.S.U. Tel: 0408-21870.

Prism VTX 5000, modem as new — unwanted gift. £75. Tel: (Bradford) 0274 81440 (eves — ask for Brian).

PCN Billboard

American Dragon/Tandy compatible cartridges not available in UK. Megabug, Castle Guard, Poltergeist etc. £10 each. Tel: (South Benfleet) 03745 4965.

Spectrum RS232 interface, connect your Spectrum to modems or other computers etc. Adjustable baud rate between 300 to 2400. £25. Tel: Oxted 5835.

Microvitec Cub monitor for BBC model 1451 as new cost £310 in July. Selling for £260. Tel: Basinstoke 51623.

MPI disk drive, 501B SS/DD bare drive. No case or p/s, perfect condition. Used less than 2 mo. £80. Tel: Chesham 0494 784409 (after 6pm).

Epson MX-80, type 3 dot-matrix printer. Very good condition. Upgrade forces sale £150 ono. Also Apple parallel interface. £30 ono. Tel: Anthony 01-578 7704 (after 7pm).

Casio FX700P with printer and cassette interface as new: £75 ono. Tel: (Leic) 0533 671228 — Charles.

Epson MX-80 type III printer £150 ono also Apple parallel interface card £30 ono. Tel: 01-578 7704 — Anthony.

Silver Reed I/F44 printer interface and cable. Connects your electronic typewriter to the BBC/B computer £60. Tel: 01-462 1379 (eves).

Acoustic couplers — pair of AV 311's. Suitable for PTN comms. Reasonable offers considered. Tel: 0884 259392.

Mitsubishi 40/80 track 400K disk drive for BBC, with disc doctor and over £1,000 of software, only £230. Tel: 05827 69152.

Brother HR5 printer with RS232, many features, as new, including mains adaptor. All for only £130. Tel: 0325-312417.

Shinwa CP80 for sale, 6 months old, boxed, as new. Excellent condition £150. Tel: 01-907 8661 (after 5pm).

Microvitec Cub monitor for BBC model 1451, as new. Cost £310 in July, £250 or near offer. Tel: Basinstoke 51623.

BBC 'B' Quickshot joystick, cost £20, sell for £10. Complete conversion, still boxed as new. Tel: Mark on 0472 695906.

Watford DFS ROM for sale, complete with Watford disk filing system manual, £22. Tel: 041-636 1239 — Tony.

Brother HR5 printer with RS232, many features, and including mains adaptor. Ideal for BBC, QL, Spectrum etc. Only £120 ono. Tel: 0325 312417.

EPROMS — 2764 (8K). Ten unused, only £65. Suitable for BBC. Tel: Julian on 0423 68383.

Wanted: about six "Disk bank" or Immac "Floppy Manager" 5.25in disk boxes. Tel: Keith on 021-328 6853.

Video Genie expander EG 3014. Gives full 48K user RAM. Also printer and disk interface. £100 bus. £85. Tel: Winchester 0962 880312.

Swap Cheetah R.A.T. infra-red joystick and interface for Quickshot II or Wild joystick + interface. Tel: 01-341 3355 — Niall.

Box of ten unused 5.25in blank disks. Single sided, double density. Unwanted gift, accept £12.75 the lot. Could post if necessary. Tel: 0244 675717.

Epson MX-80 Type III printer, £150 ono. Also Apple parallel interface card £30. Tel: Tony 01-578 7704 (after 7pm).

CT-90R semi-professional cassette deck — cost £469. Boxed, perfect condition. Offered £215 by dealer, so swap for computer + extras worth £250 or sell £250. Tel: 01-863 5113.

Microvitec Cub monitor, model 1451 MS for BBC, cost £310 in July, medium resolution, as new. £240. Tel: Basingstoke 51623.

Juki 6100 daisy wheel printer. Immaculate condition with BBC cable, boxed. £295 ono. Prism 1000 modem software and BBC cable. £50 ono. Tel: 0227 75110 (Kent).

Solidisc 32K for sale, complete with manual and software £45. Cheetah Sweet Talker speech upgrade for the BBC £18. Tel: 041-636 1239 — Tony.

Sinclair

ZX81 16K, plus full travel D.K. Tronics keyboard and two software titles. Good condition, £45 ono. Tel: 01-854 0129 evenings.

ZX Spectrum 6 months guarantee £75. Also six games tapes £20. Tel: 01-205 6919.

Swap Spectrum 48K, Interface 1, Microdrive, 4 cartridges, software, dust cover; (Spectrum under guarantee). For Commodore 64 with c2n unit. Tel: 01-907 1204 (Douglas).

48K Spectrum, £750 software, books, magazines and cassette recorder sell for £350 ono. Write to S. Royal, 33 Ealing Park Mansions, South Ealing Road, London W5 4QH.

Sinclair delivery promises have always been good for a laugh (as long as you aren't on the receiving end), and the official Spectrum upgrade is no exception. There are two possibilities: either you perform the upgrade yourself from a kit, or you send your Spectrum to Sinclair and let the experts deal with it. If you do the job yourself you're asked to allow 28 days for delivery; but if you opt for the full upgrade service you'll get the machine back in 10 days.

This is almost inexplicable—why should it take 2.8 times as long to put a box of components into the post as it does to put them together in an upgraded machine? PCN's team of experts has the answer. To get your kit of parts Sinclair's

experts have to dismantle a completed Spectrum Plus.

Arch-rival Commodore avoids this kind of trouble by producing totally incompatible, non-upgradable machines; but that's on the home side.

The company is a little over-excited about its new PC-compatible machine. This, it announces, is 'the first stage in its declared offensive on the UK business systems market'. Taken literally, this is nonsense, of course; but it is possible that the 'declared' refers to something else? Our Cricket Correspondent Christopher Martin-Bormann reports:

'On a day full of early promise and a wicket as even as an executive desktop, the Commodore innings opened smoothly

with the 4032 and 4096 seeing off the new balls. After steady but unspectacular progress, during which the 4032 was dropped several times in the gully, it was replaced at the crease by the 8000 series.

'But disaster struck the Commodore middle order. The first 8000 was dismissed after many deliveries but few runs, the 500 broke down during the drinks interval, and the 700 retired hurt after blow upon blow to its Porsche-style box.

'The incoming 8096 stopped the rot, and the 700 pluckily came back, but had to retire again after a particularly unpleasant delivery. The Commodore captain finally declared the innings closed, to spare the gritty 700 further punishment.'

SYNTAX ERRORS

Sometimes it takes a while to get the hang of the yearly change-over, so we hope you'll excuse our lapse in last week's View from the US. Where we said that there should be 1.5 million computer-related jobs by 1955, it should have read 1995.

Anyone who tried the BBC double size characters routine in Microwaves, issue 93, will have come across the problem that the machine tends to turn the display off in line 20. This is due to the two-colour limitation of Mode 0. Change the line to: PROCDOUBLE (23,1,1,"DOUBLE HEIGHT IN MODE 0") and you should be in the pink.

Memotech owners will have noticed that our Output article (issue 87) promised more than it could deliver. Due to circumstances beyond our control, the listing to produce the logo mentioned in the text was not printed. Normal service will be resumed in a future issue, when we faithfully undertake to publish the missing listing.

Two weeks ago, we printed the wrong telephone number for Thurnall Electronics. The correct number is 061-775 7922, or alternatively you could try 061-775 4461.

NEXT WEEK

Sharp patrol

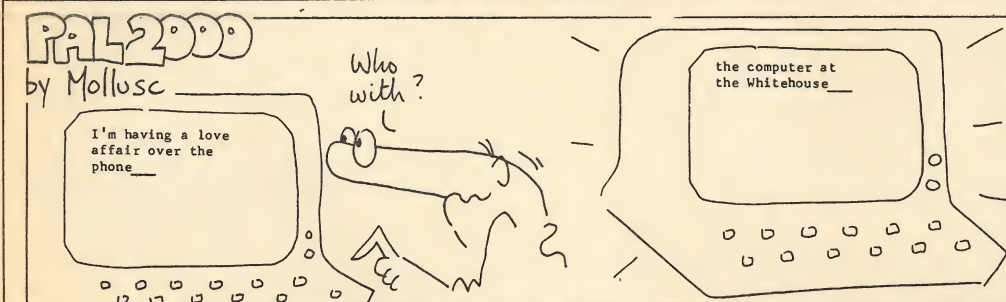
Can Sharp make the breakthrough into British businesses with its MZ5600? We find out how much of an edge it has.

Karma Koala

Transform your Koala graphics tablet into a handy extra functions unit.



LAUGHLINE — The response to the HRH Princess Anne Laughline competition was muted but respectful. Nobody mentioned corgis, horses, or importunate journalists, but there was a touch of topicality about the winner. We discounted Tony Mayne's 'Might One's' fingernails get caught between the keys... on the grounds that it went on too long, and settled instead on Donald Grant of Edinburgh's terse, economical: 'When is the christening?' Donald wins £20.



PCN DATELINES

Event	Dates	Venue	Organisers
What is artificial intelligence? Ten weekly meetings.	From Jan 15	City University, London	B Zanditon, 01-253 4399 ext 3268/9
Which Computer? Show	Jan 15-18	NEC, Birmingham	Clapp & Poliak 01-891 5051
High Technology & Computers Education	Jan 23-26	Barbican, London	Computer Marketplace Exhibitions, 01-930 1612
Intl Microcomputer Fair	Jan 29-Feb 3	Frankfurt, Germany	Collins & Endres, 01-734 0543
Apricot & Sirius Computer Show	Feb 5-7	Kensington Town Hall, London	Paradox Group, 01-241 2354
ZX Microfair	Feb 9	Alexandra Palace, London	Mike Johnston, 01-801 9172
Intl trade show for home comps, software, etc — LET	Feb 17-19	Olympia, London	Turret-Wheatland, 0923-777000
Intl Computer Graphics User	Feb 19-21	Barbican, London	Mountbuild, 01-486 1951 Show and Conference.
MEXCOM	Feb 25-28	Mexico City, Mexico	AESI Ltd, 01-379 7628
PC Trade Show	Feb 26-28	Barbican, London	EMAP Intl. Exhibitions, 01-837 3699
Computer Conference and Exhibition — INTERFACE	March 4-7	Atlanta, USA	Interface Group, 300 First Avenue, Needham, Mass 02194

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You'd expect one of the best-selling home computers in Japan to have a specification list as big as its memory.

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on one language: MSX. You can swap programs, games, cassettes, even peripherals like disk drives, printers, and joysticks: they're all compatible with every other MSX computer.

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So if you want a computer that won't be obsolete in a few years, buy an MSX. If you want one of the best-selling MSX computers in Japan, buy a Toshiba HX10.

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